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Predictors of Sexual and Reproductive Health Rights Knowledge among Adolescents in Gamo Zone, Southern Ethiopia: A Multi-Level Analysis.

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Abstract: Understanding adolescents' knowledge about Sexual and reproductive health rights (SRHR) will help to empower them with the knowledge to make well-informed choices about their sexuality guides their decision-making and improves health outcomes. Despite this, there are limited studies related to adolescents' knowledge about SRHR in the study setting. Therefore, this study aimed to assess the level of SRHR knowledge and its predictors among adolescents in Gamo Zone, Southern Ethiopia. A community-based cross-sectional study was conducted from 2 March to 9 April 2023. A multistage stratified sampling technique was used to select study participants. A Structured face-to-face interviewer-administered questionnaire was used to collect data. Summary statistics and graphs were used to present the data. A multilevel linear regression analysis was used to identify individual and area (contextual)-level variables. B-estimates at 95% confidence intervals (CI) and p-value of less than 0.05 were considered to declare a level of significance. The finding showed that 49.66% [95% CI (46.79, 52.53)] of adolescents had good knowledge about SRHR. The result of multilevel linear regression analysis reveals that older adolescents (β=4.29, 95% CI: 3.46 - 5.12), having history of sexual exposure (β=1.95, 95% CI: 0.87 –3.04), perceived risks for SRH problems (β=1.09, 95% CI: 0.10 - 2.07), had paid work in the last 12 months (β=2.49, 95% CI: 1.33 - 3.64), living with parents(β=1.62, 95% CI: 0.59 to 2.65), having exposure to social media in the last 12 months(β=1.73, 95% CI: 0.72 - 2.74), and short time spent to reach health facilities(β= 1.88, 95% CI: 0.90 - 2.85) were independent two-level predictors of SRHR knowledge. Therefore, to enhance adolescents' understanding of SRHR, the government, and other pertinent organizations must fortify the rights-based approach. Furthermore, it is imperative to enhance the distribution of information through social media, while enhancing job prospects for adolescents would enhance their knowledge of SRHR.

Keywords: Adolescents; sexual and reproductive health rights; Knowledge; Southern; Ethiopia

1. Introduction

Sexual and reproductive health rights (SRHR) are universally applicable human rights, regardless of age, gender, and other characteristics, to make choices regarding their sexuality and reproduction[1]. These rights were defined under the 'rights-based approach' at the 1994 International Conference on Population and Development (ICPD) stated that SRHR covers a range of rights to autonomy and to access SRH information and services[2]. Those rights include the rights to healthcare, information and education, life, liberty, privacy, freedom of thought, equality, freedom from torture, choice in marriage and number of children, and access to the benefits of scientific research [2, 3].

Adolescents' SRHR is of particular concern in the Sub-Saharan Africa (SSA) region due to rapid increases in the adolescent population in the region[4, 5]. This region is one of the few regions in the world where adolescents (ages 10–19)

compose the largest proportion of the population, accounting for 23% of the total population[6]. In Ethiopia, adolescents account for 21.6% of the total population[7]. Despite this huge number, the vast majority of adolescents practice high-risk behavior, such as multiple sexual partners, early sexual initiation, and unprotected sexual intercourse [8-11]. Besides this, those adolescents face barriers to accessing accurate information about their health and rights and how to protect themselves from unwanted pregnancy and sexually transmitted infections (STI)[12].

Previous studies show that due emphasis is needed for adolescents' protection from harm and to make independent decisions to understand the consequences of current actions and are often concerned about their future related to the transition to the adult role[4, 13]. From a life course approach, adolescence is a critical stage connecting childhood development to opportunities for further growth in adulthood. Many poor SRH outcomes are often traced back to adolescence and cast a shadow on an individual's life[4, 6]. Sexual relations typically pre-marital sex, STIs, unplanned pregnancies, and abortion occur mostly at this stage[14]. Further, the lack of adequate knowledge experience, and skills in rights protection, self-protection, and adequate information about STIs, and access to SRH services will be unfortunate on the reproductive health and status of the adolescents [4, 14, 15].

Adolescents' SRHR, using the right-based approach is a useful lens, used to prevent adolescents' risks of SRH ill-health including HIV/AIDS, unsafe abortions, and maternal motility, and to promote sexual and reproductive health[1, 4]. This approach is important to adolescents to actively take part in decisions regarding their own SRH like choosing one's partner, informed choices about their reproductive lives, and receiving confidential, respectful, and high-quality SRH services reduces healthcare costs, improves productivity, and saves lives which lead to greater economic growth[1, 5]. Sexual and reproductive health rights are also one of the focus areas of the Sustainable Development Goals (SDG), which are grounded in ensuring "universal access to sexual and reproductive health and reproductive rights" under target 5.6[16].

Ethiopia has made several measures to ensure significant improvements in adolescent SRHR over the past two decades, through key policy initiatives and strategic objectives in support of achieving the SDGs[12]. Despite this progress, previous studies finding show that, the finding from previous studies show that SRHR knowledge among adolescents age remains at its minimum range from 16.4% to 59.6% [17-23]. This may leave adolescents vulnerable and unable to protect themselves from unwanted pregnancy and STIs (including HIV), as well as from complications related to pregnancy and childbirth. Unless the current trend is unchanged, hundreds of thousands of adolescents will continue to suffer from those problems.

Despite a growing body of evidence focusing on SRHR, in sub-Saharan Africa including Ethiopia few studies target adolescents aged 10-19 years, the majority of prior studies in Ethiopia have largely been focused on those who lived in urban and school-going adolescents, and some others studies focus among college and university students[18-20, 22, 24]. They systematically excluded out-of-school, rural adolescents, boy adolescents, and very young group adolescents. Therefore, to study plans to fill the gap, by assessing the level of adolescents' SRHR knowledge. Moreover, understanding levels of knowledge among adolescents is crucial to gaining insights into the current efforts made to put adolescent SRHR on the SDG and to improve adolescent SRH in Ethiopia. It may also offer important insight to policymakers and program managers to design strategies and interventions to build adolescents' life skills and increase responsible behaviors based on human rights principles. This in turn would contribute to the attainment of the SDGs, in particular, SDG 3 and SDG 5 [25]. Therefore, this study aimed to assess the level of knowledge and its predictors about SRHR among adolescents in the Gamo Zone, Southern Ethiopia

2. Materials and Methods

Study setting and design

From March 02 to April 09, 2023, a community-based cross-sectional study was carried out in Gamo Zone, South Ethiopia Regional State. Administratively Ethiopia is divided into two 4 levels: the first level (regions), the second (zones), the third (woredas/ districts), and kebeles (the lowest administrative level)[26]. Arba Minch town is the administrative center of this Zone. This town is located 431 km from the Ethiopian capital city (Addis Ababa). Six town administrations and 14 rural districts with 325 kebeles were found in the Gamo zone. There are 302 health posts, 56 health centers, and five hospitals giving health care services to the population.

Population

The source population was all households that had adolescents and residents in the study area. All randomly selected households who had adolescents during the data period and fulfilled the inclusion criteria were the study population. The inclusion criteria are households who had adolescents (10-19 years old) and permanent residents (who live more than 6 months) in the selected kebeles who were eligible for this study. However, those adolescents who had known hearing or mental impairment, and/or were critically ill during the data collection were excluded from this study.

Sample size determination

The sample size was calculated using the formula for a single population proportion with the following assumptions:95% CI level, 80% power, design effect of 2, margin of error of 4% (d=0.04), and proportion of SRH services utilization of 33.8% taken from a study conducted in Central Ethiopia[27]. The calculated sample size was 1074. After adding a non-response rate of 10%, the final sample size was 1181.

Sampling Technique

A representative sample of adolescents was chosen using a multi-stage stratified sampling technique. The Gamo zone was first divided into administrative strata for town administrative and rural Districts. For each stratum (urban vs. rural), an equal number of samples (primary sampling unit) were chosen to guarantee survey accuracy. The lottery method was used to select three of the six urban administrative districts and three of the fourteen rural districts. In the second stage, independent selection from each sample stratum and a probability proportional to the number of kebeles in each stratum were used to select 36 kebeles (the secondary sampling unit), 11 urban kebeles, and 25 rural kebeles. Next, each of the chosen kebeles received a proportionate share of the sample size. Using the Family logbook, sampling frames were made for each selected Kebele with the help of the community health workers. Households with eligible participants (adolescents) were coded. Finally, using simple random sampling technique adolescents were selected. If two or more adolescents lived in the selected household, one participant was selected by the lottery method.

Operational definitions

Knowledge of SRHR was measured using 24 items that assessed participants' understanding of SRHR with Yes=1 (correct) or No=0 (incorrect) responses. The total score was calculated by summing all the items. The mean score was used to dichotomize responses to knowledge of SRHR measuring scales. The adolescents who scored greater than or equal to the mean score were considered to have "good knowledge"; otherwise "poor knowledge."[17, 20]. This helped describe the proportion of knowledge of SRHR against the background characteristics and facilitated easy understanding among the readers (program managers and implementers). Using the mean score for categorization avoids miss-classification, and the data were normally distributed.

Sexual exposure history: adolescents who ever experienced sex in their lives were classified as having a history of sexual exposure and not otherwise[27, 28].

Exposure to social media: Adolescents were asked about their use of social media (e.g., Facebook, Twitter, WhatsApp, Instagram, and TikTok) in the last 12 months. The information was collected as multiple responses from the participants. Based on these responses, we constructed a binary variable where participants who used any social media platforms were considered to have exposure to social media (coded '1') and (coded as '0') otherwise[27].

Geographical accessibility of health facilities was measured based on adolescents' self-report of time taken to reach health facilities. Those adolescents who perceived they had to travel less than 30 minutes walking distance to get to the health facility were classified as having high geographical accessibility and low otherwise[27, 28].

Data Collection Methods

Twelve health professionals who have experience in data collection collected the data and three supervisors who had master's degrees in public health supervised the process. The ability to communicate with the local language was also used as a criterion to select both the data collectors and supervisors. Two days of training were given for both data collectors and supervisors giving a focus on the data collection procedure and contents of the questionnaire. The training also focused on ensuring privacy and confidentiality and how to remain neutral during interviews for sensitive questions. The data was collected through a face-to-face interview using a structured questionnaire. The questionnaire was developed after reviewing previously conducted studies [19, 20, 22, 29, 30]. To measure adolescents' knowledge of SRHR, 24 dichotomous yes/no items questions were used. The finding from this study shows that the Reliability test result (Cronbach's α=0.9423) which is the scale had good reliability. The questionnaire was first prepared in English language and translated to the local language. The consistency of the questionnaire was checked by another expert. The local language version of the questionnaire was used for the final data collection. The data was collected by using *Ko-BoToolbox* software. The principal investigator and supervisors monitor the whole data collection process and check the data for completeness every day during the data collection time.

Data Quality Management

To maintain the quality of data young healthcare workers who can communicate in the local tongues were chosen to collect data. All supervisors and data collectors received extensive training from the lead researcher. Reproductive health specialists carried out the content and face validation of a survey instrument. Pre-test was performed on 5% (60 adolescents) in Chencha district, Gamo Zone which was not selected for the final data collection. After pretesting, content, and face validation, the necessary modifications like removing confusing and unnecessary questions are done. Data collectors made multiple (at least three) visits to participants who were not at the house for data collection to boost response rates. Both the data collectors and supervisors who had previous experience in collecting data using the Kobo Toolbox software were selected, trained and collected the data. Supervisors checked on the spot all the questionnaires to ensure their completeness. Immediately upon receipt, supervisors verified the completeness of each questionnaire. The files sent to the center by each data collector were also routinely examined by the principal investigator.

Data Analysis and Management

The collected data were cleaned, edited, and analyzed by using STATA version 14.0 statistical software. Descriptive statistics such as frequencies, percentages, means, and standard deviations were computed and presented using detailed textual narrations, graphs, and tables. The reliability of measurements was checked by using Cronbach's α for each composite variable. A Cronbach's alpha value above 0.70 is considered a high level of internal consistency[31]. The unit of analysis was at an individual level and then aggregated into the district level to compare the level of SRHR knowledge in all districts. Then two-level mixed-effect multiple linear regression models were fitted to identify the

independent predictors. Fixed (residuals) and random (intercept) effects were analyzed to assess the individual and contextual level variations respectively. Random effects models estimate the variability within the districts and between the districts, while fixed effects models only estimate within-district variability. All assumptions were checked for the mixed-effects linear regression model. The rationales for using multilevel modeling were the following. Firstly, knowledge about SRHR is influenced by the characteristics of different levels (individuals and contextual factors). Analyzing variables from different levels at one single common level using the standard binary logistic regression model leads to bias (loss of power or Type I error)[32]. We further simplify the presentation by assuming there is an adolescent-level predictor and a district-level predictor of SRHR knowledge. Multilevel models allow us to consider the individual level and the group level in the same analysis, rather than having to choose one or the other[32]. Secondly, due to the multistage stratified sampling procedure, individual adolescents were nested within communities (districts); hence, the likelihood of adolescents having SRHR knowledge is likely to be correlated to access to social media and health facilities. The assumption of independence among individuals within the same cluster and the assumption of equal variance across clusters are violated in the case of nested data. A multilevel linear regression model can account for the lack of independence across levels of nested data (i.e., individuals nested within districts). Hence, to draw appropriate inferences and conclusions from multistage stratified survey data, multilevel analysis is the appropriate method for such cases [32].

During the analysis, four separate models were fitted to reach the full model. The first level was the null model (empty model without variables), which was used to test the random effect of between and within-cluster variability which is determined by using Intra-Cluster Correlation (ICC). The intra-cluster correlation (ICC) was calculated which is one of the basic assumptions to conduct a multi-level mixed-effect model. The higher the ICC, the more relevant the community characteristics for understanding individual variation in SRHR knowledge. Model I (containing only individual variables), with the fixed level one determinant with randomly varying intercepts, was run which was used to test the effects of individual-level characteristics on SRHR knowledge. Next, Model II (containing only contextual level variables), was adjusted for community-level factors with randomly varying intercepts. Finally, model III (full model), adjusted for both individual and contextual level variables, and with fixed level 1 and level 2 predictors with randomly varying intercepts and slopes were fitted. The important characteristics of individual adolescents and clusters were concurrently fitted to one model to reveal their net fixed and random effects. In the subsequent models, to see the measure of association and its magnitude, we used β-estimates. Thus, the results of fixed effects were presented as β-estimates at their 95% confidence interval (95% CI) after considering potential confounders. Random effects were expressed in terms of ICC that explains the amount of district variation. All statistical analyses were performed at the 95% confidence interval with a 5% level of significance, and only significant variables from the final model were retained for interpretation. A widely used statistic for comparing models in multilevel linear regression models is Log-likelihood (Log-LL), Akaike information criteria (AIC), and Bayesian information criteria (BIC). According to the principle of log-likelihood, the higher the better. According to the principle of information criteria (AIC and BIC), the lower is the better[33].

3. Results

Socio-demographic and economic characteristics of adolescents

The study included 1172 adolescents in total, with a 99.24 percent response rate. The mean (±SD) age of adolescents was 15.01±2.69years. The percentage of adolescents between the ages of 10 and 14 years was 497 (42.4 %). Of those, 348 (70.0 %) of them had poor knowledge about SRHR, with a statistically significant difference (χ2=133.68, P<0.0001). Of the sex groups, about 241(47.1%) male adolescents and 341(51.7%) female adolescents had good knowledge about SRHR. However, 271(52.9%) males and 319(48.3%) females had poor knowledge about SRHR. Similar to this, there is a notable difference in the knowledge of SRH in urban and rural areas. Of the adolescents, 381(55.3%) of urban and 201(41.6%) of rural adolescents reported that they have good knowledge about SRHR (χ2=21.27, P<0.0001). Notably, 451 adolescents (38.4%) in this sample reported having used social media. Of those majorities, 320 (or 70.9%) had good knowledge, and the remaining 291 (or 29.1%) had poor good knowledge. In terms of living arrangements, 999(85.2%) of adolescents lived with their parents. Of those nearly half (49.2%) of them had good knowledge about SRHR. Regarding conversations between adolescents and their peers regarding SRH concerns, roughly 205 (17.6%) of adolescents have discussed SRH issues in the past year. Of those 165(80.5%) of them had good knowledge and the rest (19.5%) of them had poor knowledge about SRHR. Differences in adolescent-peers discussions about SRH issues were statistically significant (χ2=94.46, P= 0.0001). **(Table 1)**

Knowledge about sexual and reproductive health rights among adolescents

According to the study's findings, 49.7% [95% CI (46.8, 52.5)] of adolescents had good knowledge of SRHR. The mean (±SD) score of knowledge about SRHR was 11.69±7.56. More than half (59.2%) of adolescents know that they have the right to pursue a satisfying, safe, and pleasurable sexual life, but only 332(28.3%) know SRHR is part of a component of human rights. Adolescents who know they have the right to decide on SRH issues without their parent's consent, the right to have information and education about SRH, the right to access all sexual and reproductive health services without the consent of their parents, the right to autonomous choices to use any type of contraceptives and right to have a safe abortion and post-abortion care at a health facility were 476(40.6%), 586(50.0%), 496(42.3%), 465(39.7%), and 606(51.7%) respectively **(Figure 1 and Table 2).**

Table 1: Socio-demographic and economic characteristics of adolescents in Gamo Zone, Southern Ethiopia, 2023.

Variables	Category	Knowledge about SRHR			Test statistics
		Good knowledge	Poor knowledge	Total	
		N (%)	N (%)	N (%)	
Age (in years)	Early adolescents (10–14)	149(30.0)	348(70.0)	497(42.4)	χ2=133.68 (P=0.0001)
	Late adolescents (15–19)	433(64.2)	242(35.8)	675(57.6)	
Sex of respondent	Male	241(47.1)	271(52.9)	*512(43.7)*	χ2=2.44 (P=0.0001)
	Female	341(51.7)	319(48.3)	660(56.3)	
Residence	Urban	381(55.3)	308(44.70)	689(58.8)	χ2=21.27 (P=0.0001)
	Rural	201(41.6)	282(58.39)	483(41.2)	
Marital status	Single	1137(97.0)	554(48.7)	583(51.3)	χ2=13.3 (P=0.0001)
	Married	35(3.0)	28(80.0)	7(20.0)	
Religious facility attendance	Every day	92(54.1)	78(45.9)	170(14.5)	χ2=12.82 (P = 0.005)
	At least once a week	427(47.2)	478(52.8)	905(77.2)	
	At least once a month	54(65.9)	28(34.1)	82(7.0)	
	Never	9(60.0)	6(40.0)	15(1.3)	

The perceived economic status of household	Poor	91(41.9)	130(58.8)	221(18.9)	$\chi 2$=7.87 (P = 0.020)
	Medium	438(51.5)	412(48.5)	850(72.5)	
	Wealthy	53(52.5)	48(47.5)	101(8.6)	
Ever had sexual intercourse	Yes	125(74.0)	44(26.0)	169(14.4)	$\chi 2$=46.67 (P= 0.0001)
	No	457(45.6)	546(54.4)	1003(85.6)	
Ever discuss SRH issues with peers	Yes	165(80.5)	40(19.5)	205(17.6)	$\chi 2$=94.46 (P= 0.0001)
	No	417(43.1)	550(56.9)	970(82.4)	
Ever used social media	Yes	320(70.9)	131(29.1)	451(38.4)	$\chi 2$=132.98 (P= 0.0001)
	No	262(36.3)	459(63.7)	724(61.6)	
Paid work in the last 12 months	Yes	236(80.6)	57(19.4)	293(24.9)	$\chi 2$=149.09 (P= 0.0001)
	No	346(39.4)	533(60.6)	882(75.1)	
Living arrange-ment	Lived with their parents	491(49.2)	508(50.8)	999(85.2)	$\chi 2$=0.7029 (P= 0.402)
	Not living with their parents	91(52.6)	82(47.4)	173(14.8)	
Perceived risks for SRH problems	Yes	216(70.1)	92(29.9)	308(26.3)	$\chi 2$=70.04 (P= 0.0001)
	No	366(42.4)	498(57.6)	864(73.7)	
Geographical ac-cessibility of health facility	<30 minute	450(50.8)	436(49.2)	886(75.6)	$\chi 2$=1.859 (P= 0.173)
	≥30 minute	132(46.2)	154(53.8)	286(24.4)	

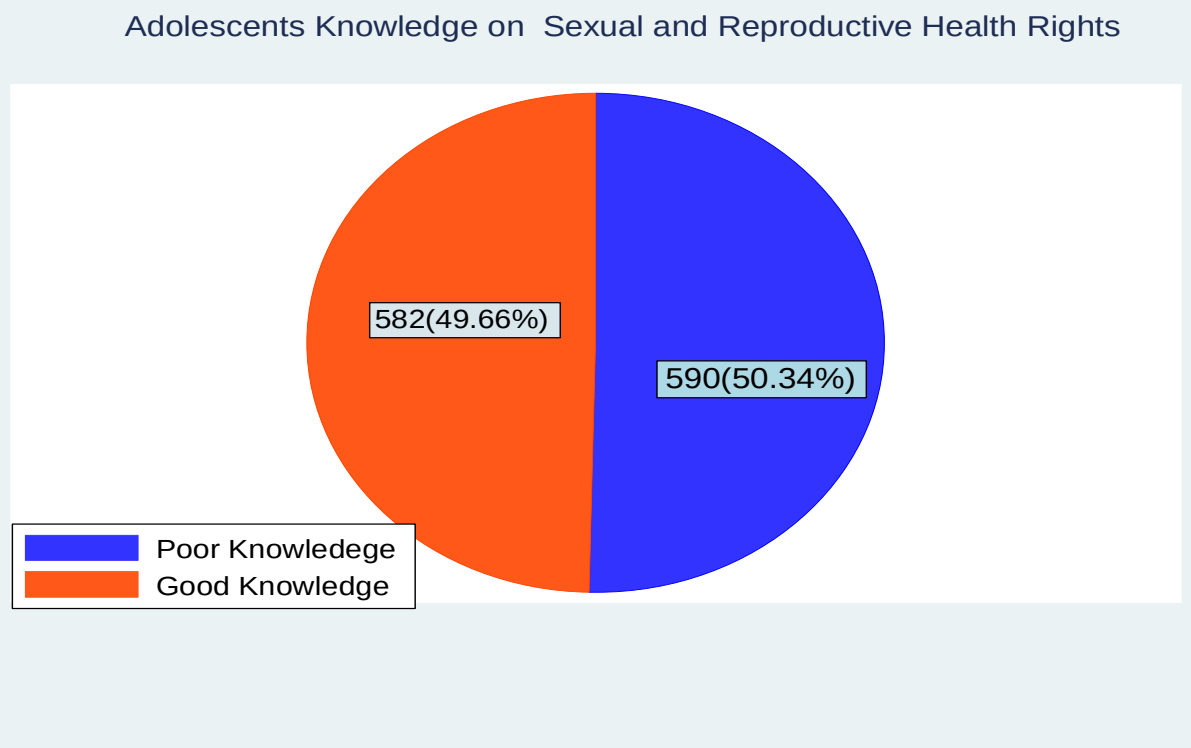

Figure 1: Adolescents' Knowledge of Sexual and Reproductive Health Rights in Gamo Zone, Southern Ethiopia, 2023.

Table 2: Responses of Adolescents to Sexual and Reproductive Health and Rights Knowledge in Gamo Zone, Southern Ethiopia, 2023.

Variables	Yes Frequency (%)
Do you know sexual and reproductive health rights are the parts of components of human rights?	332(28.3)
Do you think that all adolescents have the right to have their use of sexual and reproductive health services utilization status kept confidential?	453(38.6)
Do you think that all adolescents have the right to autonomous choices to use any type of contraceptive?	465(39.7)
Do all girls have the right to have safe abortions and post-abortion care at a health facility?	606(51.7)
Do you think victims of gender-based violence have the right to get legal support?	607(51.8)
Do you know every adolescent has the right to protection from sexual abuse, reproductive harm, and sexual discrimination?	424(36.2)
Do all adolescents have the right to mate selection without their families' consent?	532(45.4)
Do all girls have the right to resist female mutilation against their families' will?	503(42.9)
Do families have the right to decide about their children's sexual and reproductive health issues?	816(69.6)
Do you think that all adolescents have the right to have consensual sexual relations?	857(73.1)
Do adolescent girls have the same right as adolescent boys to marry with their free and full consent?	581(49.6)
Do you know legal minimum age of marriage (-------) (ask and fill in number) (if they respond 18 years, select yes)	828(70.7)
Do you think that all adolescents have the right to pursue a satisfying, safe, and pleasurable sexual life?	694(59.2)
Do you think that all unmarried girls have the right to maternity leave with adequate social security benefits?	795(67.8)
Do you think a married woman has the right to decide whether or not to have children without her husband's consent?	783(66.8)
Do you think that all adolescents have the right to have information and education about sexual and reproductive health?	586(50.0)
Do you think that all adolescents have the right to access all sexual and reproductive health services without the consent of their parents?	496(42.3)
Do adolescent girls have a right to say no to having sex, regardless of their boyfriend's wishes? Or should a man get sex whenever he wants irrespective of his girlfriend's wish?	349(29.8)
Do all adolescents have the right to ask each other for HIV testing status before sexual engagements?	783(66.8)
Do you think that every adolescent has the right to be free from all forms of discrimination because of their reproductive and sexual orientation?	347(29.6)
Do you think that all adolescents have the right to decide on sexual and reproductive health issues of themselves without their parent's consent?	476(40.6)
Do all adolescents have the right to form an association or club that aims to promote their sexual and reproductive health?	445(38.0)
Do all adolescents have the right to organize and participate in politics to influence the government to prioritize sexual and reproductive health services?	463(39.5)
Do all adolescents have the right to access and use new reproductive healthcare technologies?	484(41.3)

Measure of Variation in SRHR knowledge

To check the variation of SRHR knowledge score due to the leveled factors considered in this study, we used multi-level mixed model random effects. We first estimated an "empty" model (model 0), which only included a random intercept and allowed us to detect the existence of a possible contextual dimension for the SRHR knowledge score. In this study, the result showed that the intra-class correlation of the empty model (null model) indicated that 11.28% of the total variance in SRHR knowledge was attributable to the differences across residential areas. As reported in the ICC (model-I), 17.31% variability in the SRHR knowledge score was due to area (contextual)-level variables after controlling for individual-level factors, while in the final model, 19.6% of the variation in the SRHR knowledge score was observed after adding individual and area (contextual)-level variables. The higher the ICC, the more relevant the contextual characteristics.

To choose the best model among a set of candidate models, we compare the result of the log-likelihood, AIC, and BIC results of the multi-level mixed model. According to the principle of log-likelihood, the higher the better. So, in this analysis model, the higher Log likelihood results from the full model (model-III) had the higher log-likelihood (-3757.0437). According to the information criteria, the lower the value the better. So, in this analysis model, the lower value of AIC and BIC was the result full model (model-III). The finding showed that the full model including both individual-level and area (contextual)-level variables better fit the data. This conclusion was confirmed with both AIC (AIC=7558.03) and BIC (BIC=7618.828). The AIC (log-likelihood) values were consistently decreased from the empty model to the final model implying the models were a better fit to the data. This was also confirmed by comparing with Bayesian information criterion (BIC) values. In each model, all the AIC values are less than the BIC values. The consistent decrement in these values helps to select a covariance structure with the best-fit model. Therefore, to get the mixed effect (fixed effect and a random effect for the between residential area variation), mixed-effect linear regression analysis was better than another model. (Table 3)

Table 3: Parameter coefficients and model comparisons of each successive model in sexual and reproductive health rights knowledge among adolescents in Gamo Zone, Southern Ethiopia, 2023.

Random effect	Model-0	Model-I	Model-II	Model-I
Mean-variance at 95% confidence interval	6.47(1.98,21.112)	7.62(2.38,24.35)	7.26(2.25,23.48)	8.76(2.74,28.02)
Standard error of covariance estimate	3.90	4.52	4.35	5.19
Intra-class correlation (ICC %)	11.28%	17.31%	14.84%	19.76%
Proportional Change in Variance (PCV %)	Reference	13.72%	10.35%	24.86%
Model comparison statistics				
Log-likelihood	-3975.0141	-3780.0817	-3859.1139	-3757.0437
Akaike information criterion	7956.028	7578.163	7730.228	7558.03
Bayesian information criterion	7971.228	7623.762	7760.627	7618.828

Multi-Level Predictors of Sexual and Reproductive Health Rights Knowledge

The finding from the full (mixed) model revealed that from the individual level factors, factors like age of respondents, having history of sexual exposure, perceived risks for SRH problems, having paid work in the last 12 months, and living with parents were independent predictors. Whereas, having exposure to social media in the last 12 months and less than 30 minutes spent reaching the health facility were contextual-level predictors.

The SRHR knowledge score was 4.29 times (β=4.29, 95% CI: 3.46 - 5.12) higher among late adolescent groups as compared to early adolescent groups. Similarly, it was 1.95 times (β=1.95, 95% CI: 0.87 –3.04) higher among those who had history of sexual exposure. The SRHR knowledge score was 1.09 times (β=1.09, 95% CI: 0.10 - 2.07), and 2.49 times (β=2.49, 95% CI: 1.33 - 3.64) higher among those who perceived themselves as risks for SRH problems, and those who had paid work in the last 12 months as compared to their counterparts respectively. Also, the SRHR knowledge score was 1.62 times (β=1.62, 95% CI: 0.59 to 2.65) higher among those who lived with their parents compared to their counterparts. In the same way, the SRHR knowledge score was 1.73 times (β=1.73, 95% CI: 0.72 - 2.74) higher among those who have exposure to social media in the last 12 months compared to their counterparts. The SRHR knowledge score was 1.88 times (β= 1.88, 95% CI: 0.90 - 2.85) higher among those who accessed the health facility within 30 minutes compared to those who accessed the health facility more than 30 minutes **(Table 4).**

Table 4: Multilevel linear regression model of individual and contextual factors associated with Sexual and Reproductive Health Rights Knowledge among Adolescents in Gamo Zone, Southern Ethiopia, 2023.

Fixed effects of individual and contextual level variables	**Categories**	Model 0	Model-I	Model-II	Model-III
			β/Estimate (95% CI)	**β/Estimate (95% CI)**	**β/Estimate (95% CI)**
Individual level predictors					
Age of respondent	Early adolescent		**Ref**		**Ref**
	Late adolescent		4.76(3.97 - 5.55)**		4.29(3.46 - 5.12) **
Sex of respondent	Male		**Ref**		**Ref**
	Female		0.35(-0.36 - 1.06)		0.28(-0.42 - 0.99)
Having history of sexual exposure	Yes		1.86(0.77 - 2.95)**		1.95(0.87 - 3.04) **
	No		**Ref**		**Ref**
Perceived risks for SRH problems	Yes		1.30(0.31 - 2.29)**		1.09(0.10 - 2.07) **
	No		**Ref**		**Ref**
Paid work in the last 12 months	Yes		3.47(2.48 - 4.47)**		2.49(1.33 - 3.64) **
	No		**Ref**		**Ref**
Living arrangement	Lived with their parents		1.67(0.64 - 2.71)**		1.62(0.59 - 2.65) **
	Not living with their parents		**Ref**		**Ref**
Contextual level predictors					
Place of residence	Urban			**Ref**	**Ref**
	Rural			0.18(-0.97 - 1.33)	0.70(-0.38- 1.77)
	Yes			6.05(5.29 - 6.81) **	1.73(0.72 - 2.74) **

Exposure to social media in the last 12 months	No			**Ref**	**Ref**
Geographical accessibility of health facility	<30 minute			2.36(1.31 - 3.41) **	1.88(0.90 - 2.85) **
	≥30 minute			**Ref**	**Ref**
**p<0.05					

4. Discussion

This study aimed to assess the level of knowledge and its predictors about SRHR among adolescents in the Gamo Zone, Southern Ethiopia. The knowledge of SRHR is critical to adolescents' ability to protect themselves from unwanted SRH outcomes because a lack of knowledge of SRHR may lead to a negative perception of and failure to exercise SRHR among adolescents. The results demonstrate that almost half (49.7%) of adolescents had good knowledge about SRHR. The result of multilevel linear regression analysis reveals that older adolescents, having a history of sexual exposure, perceived risks for SRH problems, had paid work in the last 12 months, living with parents, having exposure to social media in the last 12 months, and had short time spent to reach health facilities were independent two-level predictors of SRHR knowledge. The main findings of this study are discussed below.

First, the study showed that 49.7% [95% CI (46.79, 52.53)] of adolescents had good knowledge about SRHR. This result was similar to studies done in Southeast Ethiopia (52.1%)[17], Haramaya University students in Ethiopia (52.2%)[20], Northern Ethiopia(47.1%)[21], Woldia Town Ethiopia(48.6%)[23]. However, it was lower than the study finding conducted among Wolaita Sodo University students, Ethiopia(54.5%)[24], Northwest Ethiopia(59.6%)[19], Northwest Ethiopia(55.9%)[18], and Fako, Cameroon(54.0%)[30]. Furthermore, the results of this study were higher than those of studies carried out in Aksum Ethiopia(16.4%)[22], Sri Lanka (24.4%)[5], and Ibadan Metropolis, Nigeria (18.2%)[34]. This variation might be associated with the study population, given that the majority of earlier research was done on university and college students [19, 20, 22, 24]. Evidence also suggests that university students are a more educated group of people who may know more about SRHRs because they have access to a variety of social media platforms and may take courses offered on campus[23]. The gaps reported in this study may be partly explained by the wide variety of adolescents included in this study, out-school, rural and urban, boys and girls, older adolescents aged 15–19 years, and younger adolescents aged 10-14 years.

The finding from the multilevel analysis shows that there is variability in the SRHR knowledge score due to area (contextual)-level variables after controlling for individual-level factors. This finding implied that community characteristics are very relevant for a better understanding of individual variation in SRHR knowledge scores. The finding highlights the need to consider community characteristics when designing interventions and strategies to improve adolescents' knowledge of SRHR.

This study's findings reveal that having exposure to social media was an important predictor of adolescents' knowledge of SRHRs. The results of a study conducted in India also show that exposure to social media has a strong positive association with SRH knowledge [35]. The result of this study implies that social media is an important medium for improving adolescents' SRH knowledge. Previous studies also suggested that social media-driven knowledge dissemination improved adolescents' sexual practices[36, 37]. The finding highlights the need to strengthen the dissemination of SRH information using social media platforms may be an alternative and a promising approach to improving

adolescents' SRHR knowledge. Future studies need to further understand the effectiveness of dissemination of SRH information using social media platforms may be better to understand the problems in a holistic approach.

Those older adolescents aged 15–19 years had higher odds of good knowledge about SRHR than younger adolescents aged 10-14 years. Similar findings were reported by a study conducted in eight sites in sub-Saharan Africa, which shows that after controlling variables, the age of adolescents remains a strong predictor of knowledge of menstruation and STIs other than HIV[38]. This might be due to older adolescents having more exposure to information and media[18]. This finding highlights the importance of age-sensitive approaches in the development and implementation of intervention. Policymakers and practitioners should work towards developing interventions that are sensitive to age differences and aim to increase knowledge about SRHR for all adolescents.

The SRHR knowledge score was higher for those adolescents who have history of sexual exposure and those who perceived themselves at risk for SRH problems like HIV/AIDS, unwanted pregnancies, and sexually transmitted infections. This finding is in agreement with other studies conducted in northeastern Ethiopia and Harrar Ethiopia [39, 40]. This might be because those who had exposure to sexual intercourse may discuss SRH issues with their sexual partners. Previous findings also show that adolescents who discuss with peers were more likely to know about SRH issues[39]. Another reason might be those adolescents who perceive themselves at risk for SRH problems might be adolescents to visit health facilities, which increases their knowledge about SRHR. This finding highlights the importance of developing interventions that promote risk perception among adolescents and provide them with the resources they need to protect their SRH.

The SRHR knowledge score was higher for those adolescents who lived with their biological parents. This might be if adolescents were freely discussing with their parents, they would have developed more knowledge and insight about SRHR[28]. The finding highlights the need to give due attention to those who did not live with their parents.

This study also showed that adolescents who have paid jobs in the last 12 months were more likely to be knowledgeable compared with their counterparts. This could be because most of the resources obtained from the paid jobs done by adolescents are diverted to taking care of the SRH services. After all, they can cover direct and indirect costs incurred in seeking the services. Previous studies also suggested that those socio-economic factors of adolescents were known to be associated with SRH services which could contribute to obtaining knowledge about SRHR [41]. The finding highlights the need for economic empowerment to improve adolescents' knowledge of SRHR.

Furthermore, having access to health facilities in their catchment area is one of the predictors of SRHR knowledge score. The SRHR knowledge score was nearly twice as high among those adolescents who had to travel less than 30 min to get to the health facility than those who had to travel more than 30 min. This finding is in agreement with other studies conducted in Ethiopia and Nigeria[28, 42]. The reason for this could be participants who live near to health facility are more likely to easily access SRH information from a health facility.

Strength and Limitations

One of the strengths of this study is the inclusion of most systematically excluded groups of adolescents such as out-of-school adolescents and very young adolescents of age 10-14 years. Those groups of adolescents were systematically excluded from most existing research findings, and little is known about their SRH knowledge. The finding is important for policymakers and program implementers to give due emphasis on strengthening awareness of SRHR. However, the study also has some limitations; First, this study is a cross-sectional study, which does not establish a causal relationship

between the dependent variable and the independent variables. Secondly, there may be over or underestimated SRHR knowledge by adolescents due to their sensitivity to sexual and reproductive health issues. Another limitation may be that we did not assess factors that impede the use of social media such as access to the internet, and electricity. Future researchers need to consider this in their future studies.

5. Conclusions

Adolescents' knowledge about SRHR in the study area was found to be low. The finding from the multilevel analysis shows that there is variability in the SRHR knowledge score due to area (contextual)-level variables after controlling for individual-level factors. Being older adolescents, having exposure to sexual exposure, perceived risks for SRH problems, having paid work in the last 12 months, living with parents, having exposure to social media in the last 12 months, and short time spent to reach health facilities were independent two-level predictors of SRHR knowledge identified during multilevel linear regression analysis. Therefore, to improve adolescent knowledge about SRHR, the government together with other relevant organizations should strengthen the rights-based approach. This is because ignorance of one's SRHR leads to vulnerabilities and sexual exploitation. Moreover, it is essential to address these important predictors with integrated digital and communication interventions that would improve adolescents' knowledge of SRHR. Meanwhile, designing interventions both for adolescents and their parents/caregivers is needed to improve adolescents' and their parents/caregivers' knowledge about SRHR. Future studies need to further understand parents'/caregivers' SRHR knowledge level.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study. Written informed consent has been obtained from the patient(s) to publish this paper.

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