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Academic performance and associated factors among female university students

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ABSTRACT

Background: Education serves as a vital instrument for empowering citizens to engage fully in the development process. However, various factors can impact the quality and competency of female students in higher education. In Ethiopian institutions, the proportion of female students is significantly lower than that of their male counterparts, highlighting the unique challenges faced by females that can hinder their academic success. Understanding these challenges and the factors influencing female academic performance is essential for enhancing educational outcomes and promoting greater equity in higher education.

Methods: An institutional-based cross-sectional study was conducted involving 633 female university students, supplemented by a qualitative approach. Participants were selected using a multistage sampling technique. Data were collected via a self-administered questionnaire, while qualitative data were gathered through key informant and in-depth interviews. Qualitative data were transcribed, labeled, and analyzed narratively through content analysis. Logistic regression analysis was employed to identify factors associated with academic performance.

Results: The study revealed that 11.85 % of female students (95 % CI: 9.43–14.62) experienced poor academic performance. Key factors influencing academic performance included alcohol consumption (AOR = 2.3, 95 % CI: 1.8–4.0), smoking (AOR = 2.9, 95 % CI: 1.1–7.4), working after school (AOR = 1.6, 95 % CI: 1.1–2.8), choice in preferred departments (AOR = 0.6, 95 % CI: 0.3–0.8), poor prior knowledge in English and basic science (AOR = 2.1, 95 % CI: 1.4–4.1), and insufficient parental support (AOR = 2.1, 95 % CI: 1.3–3.7).

Conclusion: The abstract effectively summarizes the key findings and offers relevant insights into the academic challenges faced by female students. More than one in ten female students encounters significant academic obstacles influenced by factors such as substance use, after-school employment, limited department choice, and inadequate foundational knowledge. Addressing these issues is crucial for improving academic performance and reinforcing support systems for female students, thereby providing a solid foundation for future studies in this area.

Introduction

Education is pivotal in shaping individuals' futures, equipping them with essential skills and knowledge for their roles in society. Academic performance serves as a key indicator of educational success and effectiveness, reflecting the extent to which students achieve their educational goals and competencies [1,2]. For female university students, this performance can be influenced by a range of factors, including socio-cultural, economic, and institutional variables [3]. Globally, disparities in educational access and outcomes are often exacerbated by socio-cultural norms, economic challenges, and institutional barriers [4]. These issues are more pronounced in Ethiopia, where female university students encounter unique challenges, including gender-based violence, limited academic support, and socio-cultural pressures that hinder their academic success [5].

Historically, female students have faced challenges that impact their

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academic outcomes. Gender-specific obstacles, such as societal expectations, cultural norms, and economic constraints, can affect their educational achievements [6,7]. In many contexts, these challenges are compounded by inadequate institutional support and a lack of tailored interventions designed to address the unique needs of female students [8].

In Ethiopia, efforts have been made to address these disparities through affirmative action and targeted educational programs. The Federal Ministry of Education has initiated several programs aimed at reducing gender gaps in enrollment, retention, and performance among female students [9]. Despite these efforts, female students often encounter ongoing barriers, including limited access to educational resources, gender-based discrimination, and socio-economic pressures that hinder their academic success [10,11]. Research indicates that female students encounter various barriers, including substance use, lack of parental support, and insufficient foundational knowledge, which can adversely impact their academic performance [12]. However, it is crucial to recognize that many of these challenges may also apply to male students, who experience their own set of obstacles in the academic environment. For instance, issues such as alcohol consumption and work commitments after school can similarly affect male students' academic outcomes [13].

Studies conducted in different countries reveal that poor academic performance was reported to be 3.1 % in Oman [14], 18.8 % in Brazil [15], and 27.4 % in Bangladesh [16]. Previous studies in Ethiopia also found that poor academic performance ranges from 34 % to 38.3 % [17–19]. Research has identified several critical factors that influence academic performance among female students. Students who consumed alcohol or smoked experienced poorer academic performance compared to those who did not engage in these behaviors [12,20,21]. A few studies also found that working after school increased the likelihood of poor academic performance, with students who worked being more likely to struggle academically compared to their non-working peers [22,23]. Additionally, female students with poor prior knowledge in English and basic science are more likely to face academic challenges [24,25]. Personal factors, such as prior academic achievements, study habits, and time management skills, play a substantial role in determining academic success. Students who exhibit strong academic backgrounds and effective study strategies are generally better positioned to perform well [26]. Students without a preferred department struggled academically, while inadequate parental support increased the likelihood of poor academic performance [27–31].

Institutional factors, including the availability of support services and the presence of gender biases within educational environments, also impact their performance. Institutions that provide supportive and inclusive environments tend to see better academic outcomes for female students [32,33]. Socio-economic factors, such as financial constraints and family responsibilities, further affect academic performance by creating additional pressures on students [34,35].

Understanding these determinants is crucial for developing targeted strategies to improve academic performance among female university students. By identifying and addressing the specific challenges faced by female students, policymakers and educational institutions can implement more effective interventions [36,37]. These may include enhancing support systems, providing additional resources, and fostering a more inclusive and equitable educational environment [17,38]. This research aims to explore the factors influencing academic performance among female university students, offering insights that can inform policies and practices to bridge gender gaps and improve educational outcomes.

Methods

Study area and period

This study was conducted across three campuses of Aksum University, located in the Tigray National Regional State in northern Ethiopia, a region home to one of the country's prominent universities. Aksum University is among the newer public higher education institutions in Ethiopia. It is situated in Aksum town, approximately 1010 km north of Addis Ababa, the capital city. Initially, the university comprised a single campus with three colleges. Over time, it expanded to include two additional campuses, now hosting six colleges and one school. Currently, Aksum University operates three campuses (Mayako Campus, Main Campus, and Shire Campus), with a total student population of 13,128. The study was conducted from May to June 2022.

Study design, population, and eligibility criteria

An institution-based cross-sectional study design, supported by a qualitative approach, was employed. The source population included all female students at Aksum University during the 2022 academic year, while the study population focused on all regular undergraduate female students enrolled in 2022. For the qualitative approach, purposively selected key informant interviews and in-depth interviews were conducted with female students, female lecturers, and the gender officer. All regular undergraduate students in 2022 were eligible to participate in the study. However, students on academic leave, traveling, or otherwise unavailable during the data collection period were excluded after being checked for availability at least twice.

Sample size determination and sampling procedure

The sample size was determined using a single population proportion formula, assuming a 50 % proportion, which provides the maximum sample size since no prior studies specifically examine academic responses among female youth students. A *Z*-value of 1.96, corresponding to a 95 % confidence interval ($Z\alpha/2$), and a margin of error (d) of 5 % were used, yielding a sample size of 384 participants. To account for the increased variability associated with the multistage sampling technique, a design effect of 1.5 was applied, increasing the sample size to 576. After factoring in a 10 % non-response rate, the final sample size was adjusted to 633 participants.

A multistage stratified simple random sampling technique was employed. The process began with the selection of all three campuses of Aksum University. In the second stage, a comprehensive list of colleges and departments was obtained from university authorities. Using simple random sampling, four out of six colleges and two institutes were selected. In the third stage, four departments were randomly chosen from each selected college across the campuses, totaling 16 departments. Finally, students were selected from these departments, with sampling stratified by their academic year—1st, 2nd, 3rd, 4th, and 5th years. Proportional allocation was used to ensure that the sample accurately represented the size of each student batch, providing a well-rounded and representative sample for the study.

Data collection tools and procedures

Data collection was conducted using a self-administered questionnaire (Supplementary files 1). This pretested, structured tool was developed by reviewing various studies and was later adapted to the local context, focusing on academic performance and associated factors. Ten trained BSc nurses collected the data under the supervision of three MSc nurses. Before starting the data collection, participants were given a brief introduction by the data collectors, explaining the study's objectives and emphasizing the importance of their participation. For the qualitative section, volunteers were interviewed using key informant and in-depth interviews (Supplementary files 2). The academic performance of participants was double-checked with the respective registrar office after obtaining consent from the participants.

Supplementary files 1:Supplementary files 1: Amharic version of the questionnaire.

Supplementary files 2:Materials used to guide qualitative interviews.

Variables and definitions

Academic performance or achievement was measured as the mean cumulative grade point average (CGPA) of two consecutive semesters. Excellent academic performance was defined as a CGPA of 3.50 to 4.00, good academic performance as a CGPA of 2.75 to 3.49, satisfactory academic performance as a CGPA of 2.00 to 2.74, and poor academic performance as a CGPA of 0.00 to 1.99.

Data quality control

Data Quality Assurance measures were implemented to maintain the integrity of the data. Both the data collectors and the supervisor received comprehensive training and orientation. The questionnaire, originally developed in English, was translated into Amharic and then back-translated into English to ensure accuracy and consistency. A pretest was conducted with 5 % of the sample at Adigrat University, and necessary adjustments were made based on the findings. Throughout the data collection process, daily on-site reviews were carried out by the supervisors and principal investigator to ensure data completeness and consistency. To further enhance data reliability, a double data entry process was used to reduce entry errors.

Data processing and analysis procedures

Descriptive statistics such as proportions, percentages, ratios, frequency distributions, means, and standard deviations were used to describe the data. SPSS version 25 was used for analysis [39]. A multinomial logistic regression model was employed to assess the association between explanatory and outcome variables. All assumptions of multinomial logistic regression were checked. All relevant covariates were included in the multivariable model, irrespective of their *P*-values. The variance inflation factor (VIF) and tolerance values were used to check for the presence of multicollinearity between variables. A VIF above 4 or tolerance below 0.25 indicated that multicollinearity might exist [40–43]. For the qualitative data, it was transcribed, labeled, and analyzed using content analysis. The researcher first read through the interview transcripts to identify key issues in each response category. This process helped generate themes and sub-themes from the data. An index of numbered themes was created, and each transcript was reviewed in detail, with relevant data being marked according to the index. Files corresponding to the main themes were organized using Microsoft Word for further analysis [44]. The narratives were coded using thematic analysis, where two independent researchers initially coded the transcripts to identify key themes and patterns. To ensure reliability, we calculated inter-coder reliability, achieving a Cohen's Kappa value of 0.85, indicating strong agreement between coders. Furthermore, we performed member checking by sharing preliminary findings with participants to validate our interpretations and ensure accuracy. We also engaged in peer debriefing sessions with colleagues to discuss the coding process and findings, enhancing the credibility of our results.

Results

Sociodemographic characteristics

Among the 633 respondents, the majority, 555 (78.1 %), were aged between 20 and 23 years. A remarkable proportion, 395 (62.4 %), came from rural areas, while 107 (16.9 %) lived off-campus. Most participants, 397 (62.7 %), were in their second year of study, and the majority, 388 (61.3 %), were single. Additionally, 257 (40.6 %) of the respondents had illiterate mothers, while 172 (27.2 %) had illiterate fathers (Table 1).

Table 1
Socio-demographic characteristics of female students at Aksum University.

Variable	Category	Poor (n%)	Satisfactory (n%)	Good (n%)	Excellent (n%)	Total (n%)
Childhood Residence	Urban	34 (14.3 %)	89 (37.4 %)	65(27.3 %)	50 (21 %)	238 (37.6 %)
	Rural	41 (10.4 %)	138 (34.9 %)	127 (32.2 %)	89 (22.5 %)	395 (62.4 %)
Religion	Orthodox	61 (12.3 %)	184 (32.7 %)	148 (30 %)	101 (20.4 %)	494 (78 %)
	Muslim	6 (9.4 %)	19 (29.7 %)	21 (32.8 %)	18 (28 %)	64 (10.1 %)
	Catholic	0	9 (52.9 %)	8 (47 %)	0	17 (2.7 %)
	Protestant	8 (13.8 %)	15 (25.9 %)	15 (25.9 %)	20 (34.5 %)	58 (9.2 %)
Marital Status	Single	53 (13.7 %)	129 (32.2 %)	117 (30.2 %)	89 (22.9 %)	388 (61.3 %)
	Married	9 (10 %)	40 (44.4 %)	25 (27.8 %)	16 (17.8 %)	90 (14.2 %)
	With Fiancée	13 (8.4 %)	58 (37.4 %)	50 (32.3 %)	34 (21.9 %)	155 (24.5 %)
Age (Mean ± SD)		21.39 ± 1.49	21.63 ± 1.48	21.34 ± 1.49	21.37 ± 1.55	21.46 ± 1.50
College	Health Science	16 (14.5 %)	32 (29.1 %)	37 (33.6 %)	25 (22.7 %)	110 (17.4 %)
	Business & Economics	8 (4.1 %)	78 (39.8 %)	64 (32.7 %)	46 (23.5 %)	196 (31 %)
	Agriculture	18 (12.9 %)	60 (43.2 %)	40 (28.8 %)	21 (15.1 %)	139 (22 %)
	Natural & Computational	33 (17.6 %)	57 (30.3 %)	51 (27.1 %)	47 (25 %)	188 (29.7 %)
Year of Study	Second Year	52 (13.1 %)	122 (30.7 %)	127 (32 %)	96 (24.2 %)	397 (62.7 %)
	Third Year	17 (8.9 %)	90 (46.9 %)	51 (26.6 %)	34 (17.7 %)	192 (30.3 %)
	Fourth Year	6 (13.6 %)	15 (34.1 %)	14 (31.8 %)	9 (20.5 %)	44 (7 %)
Income per Month	<400	16 (8 %)	97 (48.7 %)	62 (31.2 %)	24 (12.1 %)	199 (31.4 %)
	400–600	29 (12.6 %)	73 (31.7 %)	71 (30.9 %)	57 (24.8 %)	230 (36.3 %)
	>600	30 (14.7 %)	57 (27.9 %)	59 (28.9 %)	58 (28.4 %)	204 (32.2 %)
Current Place of Living	Outside University	21 (19.6 %)	37 (34.6 %)	28 (26.2 %)	21 (19.6 %)	107 (16.9 %)
	Inside University	54 (10.3 %)	190 (36.1 %)	164 (31.2 %)	118 (22.4 %)	526 (83.1 %)
Mother's Education	Illiterate	36 (14 %)	100 (38.9 %)	62 (24.1 %)	59 (23 %)	257 (40.6 %)
	Write & Read	17 (8.9 %)	70 (36.5 %)	66 (34.4 %)	39 (20.3 %)	192 (30.3 %)
	Primary [1–8]	14 (13.1 %)	30 (28 %)	40 (37.4 %)	23 (21.5 %)	107 (16.9 %)
	Secondary [9–12]	5 (9.8 %)	25 (49 %)	11 (21.6 %)	10 (19.6 %)	51 (8.1 %)
	Higher Education	3 (11.5 %)	2 (7.7 %)	13 (50 %)	8 (30.8 %)	26 (4.1 %)
Father's Education	Illiterate	31 (18 %)	64 (37.2 %)	39 (22.7 %)	38 (22.1 %)	172 (27.2 %)
	Write & Read	18 (9.9 %)	74 (40.9 %)	56 (30.9 %)	33 (18.2 %)	181 (28.6 %)
	Primary [1–8]	11 (8.7 %)	47 (37.3 %)	46 (36.5 %)	22 (17.5 %)	126 (19.9 %)
	Secondary [9–12]	7 (10.4 %)	20 (29.9 %)	21 (31.3 %)	19 (28.4 %)	67 (10.6 %)
	Higher Education	8 (9.2 %)	22 (25.3 %)	30 (34.5 %)	27 (31 %)	87 (13.7 %)

Academic performance

The majority of female students, 227 (35.86 %), were categorized under satisfactory academic performance based on their cumulative CGPA. Meanwhile, 192 (30.33 %) were classified as having good academic performance, and 75 (11.8 %) were identified as having poor academic performance. (Fig. 1).

Personal-related characteristics

Of the students, 350 (55.3 %) perceived that menstruation affected their academic performance. Additionally, 232 (36.7 %) and 200 (31.6 %) of the students reported that they did not come to the university or their respective department by choice. Peer pressure was also perceived as another factor influencing academic performance, with 362 (57.2 %) of the students agreeing that peer pressure affected their academic achievement (Table 2).

Institutional related characteristics

In terms of institutional characteristics, 28.8 % of respondents rated the suitability of guidance and counseling as poor, while 71.2 % rated it as satisfactory or higher. Additionally, 48.8 % of participants reported experiencing sexual harassment, in contrast to 51.2 % who did not. Regarding the implementation of harassment policies, 47.4 % perceived it as inadequate, while 52.6 % viewed it positively. Furthermore, 32.7 % indicated a lack of adequate learning materials, whereas 67.3 % confirmed their availability (Table 3).

Multicollinearity test

The variance inflation factor (VIF) and tolerance values were used to check for the presence of multicollinearity between variables. In this study, the maximum VIF was 1.61, with a mean VIF of 1.23, and the minimum tolerance value was 0.76. Thus, there was no multicollinearity between covariates (Supplementary files 3).

Supplementary files 3:VIF and tolerance test to check the existence of multicollinearity between covariates.

Assumption tests for multinomial logistic regression

The results from the tests indicate that all assumptions of the multinomial logistic regression model are satisfied, suggesting that the model fits the data appropriately (Table 4).

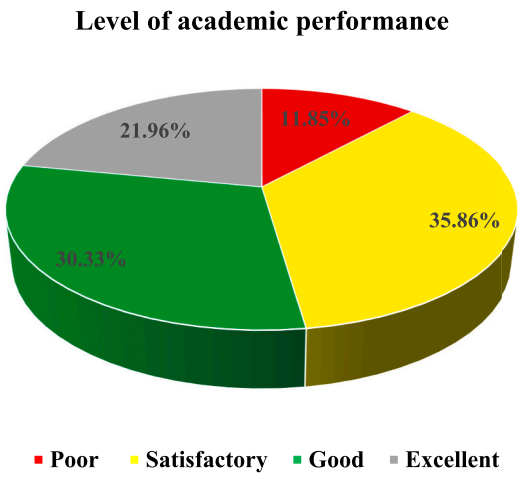


Fig. 1. Level of academic performance of female students at Aksum University.

Factors associated with academic performance

In qualitative findings, students highlighted various factors affecting their academic performance, with one student articulating a substantial challenge related to the lack of protective rules and regulations against harassment. A 23-year-old third-year accounting student shared, *"Even if there are a lot of factors in this university, for me, the main challenge was the non-availability of rules and regulations that protect females from harassment. I was a victim, and even after reporting to the responsible bodies, I received no justice. This had a negative effect on my performance; I was disturbed psychologically and lost interest in attending class, participating, and completing assignments. I couldn't even prepare for exams properly."*

Similarly, another student from the College of Agriculture provided a similar perspective: *"Girls too often encounter violence in the university, even if the degree is quite different. I dropped a course because of this stupid violence by an instructor, but no one could understand how much I suffered, including my friends and officials like the gender office." (A 20-year-old student from the Department of Plant Science).*

Furthermore, in response to the Key Informant Interview (KII) question about strategies used to support female students, one of the heads of the gender office stated, *"To improve female students' academic performance, it requires a clear understanding of social, cultural, economic, institutional, and personal factors. As much as possible, we are trying to support them by providing assertiveness training and raising awareness about sexual harassment. We facilitate tutorials, even if they are not regular, and sometimes offer financial support based on legislation. For example, there were 30 female students who were dismissed from the campus due to low academic performance. Instead of sending these students home, the university offered them the chance to attend a TVET program with support for housing, food, and transportation, and they became more productive than before."* This approach underscores the importance of comprehensive support systems that address both academic and personal challenges faced by female students, leading to improved outcomes.

Another student from the College of Business and Economics identified menstrual symptoms as a critical factor contributing to her academic failure. She stated, *"During menstruation, I don't have any desire to go to class, to do assignments, and to study hard. I feel inferiority."*

In response to the interview question about the major factors affecting female academic performance, one female lecturer remarked, *"Socio-cultural factors play a vital role in their performance, which may be due to their childhood cultural influences. Most of the time, they don't even have the desire to participate in class activities and tend to be passive during group discussions; they prefer to work alone and doubt their correctness. In my opinion, the support system for female students regarding their academic achievement seems very poor. There is no organized counseling and guidance service, regular tutorial provision, or separate reading space where they can study freely."*

Department placement by student choice emerged as another factor associated with academic outcomes. In this study, students who were assigned to departments they did not choose were six times more likely to fall into the category of poor academic performance compared to those in the excellent group. One student shared, *"I was assigned to the Department of Physics without my choice. Consequently, I lost interest in the department and started to feel like this was not my destiny, that I didn't deserve this. I became careless in my studies and am now a readmitted student."*

All relevant covariates were included in the multivariable model, irrespective of their *P*-values. The multivariable logistic regression model identified associated factors of poor academic performance among female university students. These predictors include alcohol consumption, smoking, working after school, department placement by choice, prior knowledge in English and basic science, and parental support.

Female students with poor prior English & basic Science knowledge faced a remarkable increased odd of academic challenges, being 2.1 times more likely to struggle compared to their peers with good

Table 2
Personal-related characteristics of female students in relation to their academic performance.

Variable	Category	Academic performance				
		Poor	Satisfactory	Good	Excellent	Total
Mensuration affect performance	Yes	53(15.1 %)	139(39.7 %)	107(30.6 %)	51(14.6 %)	350(55.3)
	No	22(7.8 %)	88(31.1 %)	85(30 %)	88(31.1 %)	283(44.7 %)
University by choice	No	30(12.9 %)	91(39.2 %)	63(27.2 %)	48(20.7 %)	232(36.7 %)
	Yes	45(11.2 %	136(33.9 %	129(32.2 %	91(22.7 %	401(63.3 %)
Department by choice	No	43(21.5 %)	77(38.5 %)	51(25.5 %)	29(14.5 %)	200(31.6 %)
	Yes	32(7.4 %)	150(34.6 %)	141(32.6 %)	110(25.4 %)	433(68.4 %)
Harmonious relation with students and teacher	No	35(22.6 %)	71(45.8 %)	39(25.2 %)	10(6.5 %)	155(24.5 %)
	Yes	40(8.4 %)	156(32.6 %)	153(32.0 %)	129(27.0 %)	478(75.5 %)
Peer pressure has effect on performance	Yes	52(14.4 %)	147(40.6 %)	106(29.3 %)	57(15.7 %)	362(57.2 %)
	No	23(8.5 %)	80(29.5 %)	86(31.7 %)	82(30.3 %)	271(48.2 %)
How do you rate your effort and studying habit	Poor	31(19.6 %)	85(53.8 %)	28(17.7 %)	14(8.9 %)	158(%)
	Good	30(9.8 %)	102(33.2 %)	116(37.8 %)	59(19.2 %)	307(48.5 %)
	Very good	14(8.3 %)	40(23.8 %)	48(28.6 %)	66(39.3 %)	168(26.5)
Alcohol	Yes	10 (8.3 %)	80 (66.7 %)	20 (16.7 %)	10 (8.3 %)	120(43.1 %)
	No	29 (9.6 %)	80 (26.5 %)	98 (32.5 %)	95 (31.5 %)	302(56.9 %)
Smoking	Yes	6 (13.3 %)	22 (48.9 %)	14 (31.1 %)	3 (6.7 %)	45 (15.9 %)
	No	30(18.1 %)	45 (27.1 %)	60 (36.1 %)	31 (18.7 %)	166(84.1 %)
Prior English and basic science knowledge	Poor	16(13.6 %)	76(64.4 %)	18(15.3 %)	8(6.8 %)	118(18.6 %)
	Medium	46(15.0 %)	91(29.7 %)	104(34.0 %)	65(21.2 %)	306(48.3 %)
	Good	13(6.2 %)	60(28.7 %)	70(33.5 %)	66(31.6 %)	209(33 %)
Presence of stress and anxiety	Yes	47(18.8 %)	131(52.4 %)	47(18.8 %)	25(10.0 %)	250(39.5 %)
	No	28(7.3 %)	96(25.1 %)	145(37.9 %)	114(29.8 %)	383(60.5 %)
Parental support	Low	21(28.0 %)	32(42.7 %)	11(14.7 %)	11(14.7 %)	75(11.8 %)
	Medium	29(12.2 %)	100(42.2 %)	64(27.0 %)	44(18.6 %)	237(37.4 %)
	High	25(7.8 %)	95(29.6 %)	117(36.4 %)	84(26.2 %)	321(50.7 %)
Being non-café or living out side	Yes	29(8.7 %)	141(42.1 %)	94(28.1 %)	71(21.2 %)	335(52.9 %)
	No	46(15.4 %)	86(28.9 %)	98(32.9 %)	68(22.8 %)	298(47.1 %)

Table 3
Institutional-related characteristics mentioned by students in relation to their academic performance.

Variable	Category	Academic performance level				Total
		Poor	Satisfactory	Good	Excellent	
How do you rate the suitability	Poor	56(30.8 %)	57(31.3 %)	46(25.3 %)	23(12.6 %)	182(28.8 %)
	Good	19(4.2 %)	170(37.7 %)	146(34.4 %)	116(25.7 %)	451(71.2 %)
guidance and counseling	No	59(14.4 %)	154(37.6 %)	121(29.5 %)	76(18.5 %)	410(64.8 %)
	Yes	16(7.2 %)	73(32.7 %)	71(31.8 %)	63(28.3 %)	223(35.2 %)
Experienced sexual harassment	Yes	56(18.1 %)	123(39.8 %)	74(23.9 %)	56(18.1 %)	309(48.8 %)
	No	19(5.9 %)	104(32.1 %)	118(36.4 %)	83(25.6 %)	324(51.2 %)
Types of harassment experienced	Rape	3(23.1 %)	9(69.2 %)	1(7.7 %)	0(0.0 %)	13(4.2 %)
	Attempted for rape	22(62.9 %)	13(37.1 %)	0(0.0 %)	0(0.0 %)	35(11.2 %)
	Unwelcome touching	8(18.2 %)	14(31.8 %)	10(22.7 %)	12(27.3 %)	44(14.1 %)
	Verbal or emotional	19(9.6 %)	78(39.4 %)	58(29.3 %)	43(21.7 %)	198(63.5 %)
	Sexual practice for grade	7(24.1 %)	9(47.4 %)	5(26.3 %)	1(5.3 %)	22(9.1 %)
Implementation of polices in harassment	No	51(17.0 %)	103(34.3 %)	80(26.7 %)	66(22.0 %)	300(47.4 %)
	Yes	24(7.2 %)	124(37.2 %)	112(33.6 %)	73 (21.9 %)	333(52.6 %)
Adequate learning material	No	30(14.5 %)	68(32.9 %)	57(27.5 %)	52(25.1 %)	207(32.7 %)
	Yes	45(10.6 %)	159(37.3 %)	135(31.7 %)	87(20.4 %)	426(67.3 %)
Competent and experienced teachers	No	25(11.4 %)	80(36.4 %)	68(30.9 %)	47(21.4 %)	220(34.5 %)
	Yes	50(12.1 %)	147(35.6 %)	124(30.0 %)	92(22.3 %)	413(65.2 %)
Rate rewarding system for good scorer	Poor	51(14.2 %)	127(35.5 %)	107(29.9 %)	73(20.4 %)	358(56.6 %)
	Good	24(8.7 %)	100(36.4 %	85(30.9 %	66(24.0 %	275(43.4 %)
Reading place for female only	No	39(11.5 %)	134(39.6 %)	91(26.9 %)	74(21.9 %)	388(53.4 %)
	Yes	36(12.2 %)	93(31.5 %)	101(34.2 %)	65(22.0 %)	295(46.6 %)
Tutorial provision	No	64(14.0 %)	179(39.1 %)	131(28.6 %)	84(18.3 %)	458(72.4 %)
	Yes	11(6.3 %)	48(27.4 %)	61(34.9 %)	55(31.4 %)	175(27.6 %)

knowledge (AOR = 2.1, 95 % CI: 1.4–4.1). Those who consumed alcohol had odds 2.31 times greater for experiencing poor academic performance (AOR = 2.3, 95 % CI: 1.8–4.0), while female students who smoked had odds that were even higher at 2.9 times (AOR = 2.9, 95 % CI: 1.2–7.4). Additionally, working after school increased the likelihood of poor academic performance, with those students being 1.6 times more likely to struggle compared to non-working peers (AOR = 1.6, 95 % CI: 1.1–2.8). Moreover, students who had a department of interest were 40 % less likely to face academic difficulties compared to those who did not engage in a department that captured their interest (AOR = 0.6, 95 % CI: 0.3–0.8). Finally, inadequate parental support raised the odds of poor academic performance, making those students 2.1 times more likely to struggle compared to their counterparts with strong support (AOR = 2.1, 95 % CI: 1.3–3.7) (Table 5).

Discussion

The results of this study indicate that approximately 12 % of female university students experience poor academic performance. Poor academic performance is influenced by alcohol consumption, smoking, work after school, department choice, prior knowledge in English and basic science, and parental support.

Table 4
Assumption tests for multinomial logistic regression.

Assumption	Test/Method	Result	Interpretation
Independence of Irrelevant Alternatives (IIA)	Hausman-McFadden test	Not violated ($p > 0.05$)	The choice between categories is unaffected by the inclusion of other alternatives.
No Multicollinearity	Variance Inflation Factors	All VIFs <4, no multicollinearity detected	Predictors are not highly correlated, ensuring reliable estimates.
Linearity in the Logit	Box-Tidwell test	No significant interactions ($p > 0.05$)	The relationship between predictors and the logit is linear.
Goodness-of-Fit	Deviance and Pearson Chi-Square	Model fits well ($p > 0.05$)	The model adequately fits the observed data.
Overall Model Significance	Likelihood ratio test	Significant improvement ($p < 0.001$)	The predictors as a group significantly improve the model fit.

This finding is lower than previous studies in Ethiopia, which reported rates of 34 % [17], 35.4 % [18] and 38.3 % [19]. Additionally, studies conducted abroad also report high prevalence rates of poor academic performance, with figures such as 18.8 % in Brazil [15] and 27.4 % in Bangladesh [16]. In contrast, the prevalence in this study is higher than that reported in a study conducted in Oman, which found a rate of only 3.1 % [14]. One key reason for the variation in academic performance among female university students is the definition of the cutoff point for poor academic performance. Different studies may use varying thresholds to categorize performance, leading to discrepancies in reported prevalence rates. Additionally, cultural attitudes toward education, differences in educational systems, and varying levels of parental and institutional support all contribute to these variations. Socioeconomic factors, such as access to resources and health-related behaviors like alcohol consumption and smoking, can also impact performance.

Students who consumed alcohol and smoked experienced poorer academic performance compared to those who did not engage in these behaviors. This finding is consistent with previous studies [12,20,21]. The reasons for this include cognitive impairments caused by these substances, health issues like fatigue and anxiety, and poor time management [45]. Additionally, social environments that prioritize drinking and smoking can detract from academic focus. To address this, educational institutions can implement intervention programs to reduce substance use, promote health education, and provide support services for affected students. The observed link between smoking and academic performance may be influenced by various external factors, such as stress and anxiety, leading to increased smoking as a coping mechanism. Nicotine, known as a neuro-stimulant, may actually have the potential to enhance certain cognitive functions, which complicates the interpretation of our results. Therefore, we propose that smoking could be a symptom of broader social and psychological stressors rather than a direct cause of poor academic performance. This nuanced understanding underscores the need for further research to explore the underlying factors contributing to the relationship between smoking and academic outcomes in female students.

Additionally, working after school increased the likelihood of poor academic performance, with working students being more likely to struggle compared to their non-working peers. This finding is supported by other studies [22,23]. Balancing work and study can decrease academic performance. Students who juggle both responsibilities often struggle to manage their time and energy, resulting in lower grades and increased stress. This difficulty can hinder their ability to focus on coursework and complete assignments effectively, ultimately leading to poor academic performance.

Table 5
Factors associated with poor academic performance among female university students.

Variable	Category	COR (95 % CI)	AOR (95 % CI)	p-value
Age	15–19 years	1	1	1
	20–24 years	0.8 (0.4–2.9)	0.7 (0.2–1.6)	0.2
	25–29 years	0.7 (0.3–0.9)	0.5 (0.2–0.9)	0.4
Residence	Rural	1	1	
	Urban	1.6 (1.1–2.2)	1.1 (0.6–1.8)	0.5
Mothers' Education	No formal education	1	1	
	Primary	1.2 (0.8–1.7)	1.0 (0.6–1.8)	0.9
	Secondary	1.2 (0.8–2.0)	1.1 (0.5–2.2)	0.8
Fathers' Education	No formal education	1	1	
	Primary	1.3 (0.9–2.0)	1.3 (0.8–2.1)	0.3
	Secondary	1.5 (0.9–2.3)	1.1 (0.6–2.2)	0.8
Faculty of the student	Non-medical/ Health	1	1	
	Medical/ Health	3.3 (2.0–5.2)	2.7 (1.6–4.8)	0.5
Mothers' Occupation	Housewife	1	1	
	Gov't employee	1.9 (1.2–3.0)	1.2 (0.6–2.3)	0.7
	Self-employed	1.2 (0.8–1.7)	0.8 (0.5–1.4)	0.4
Fathers' Occupation	Farmer	1	1	
	Gov't employee	1.4 (0.9–2.1)	0.9 (0.5–1.9)	0.7
	Self-employed	1.3 (0.9–2.0)	1.0 (0.6–1.8)	0.9
Alcohol Consumption	No	1	1	
	Yes	2.5 (1.9–5.0)	**2.3 (1.8–4.0)**	**<0.0001**
Smoking	No	1	1	
	Yes	3.7 (1.4–7.9)	**3.0 (1.1–7.4)**	**0.02**
Khat Use	No	1	1	
	Yes	2.2 (1.0–5.0)	1.7 (0.6–4.8)	0.3
Breakfast	No	1	1	
	Yes	0.4 (0.1–1.2)	0.5 (0.1–1.6)	0.2
Study Hours per Day	≤ 4 h	1	1	
	> 4 h	1.7 (1.2–2.5)	1.4 (0.9–2.3)	0.1
Work After School	No	1	1	
	Yes	1.7 (1.1–3.2)	**1.6 (1.1–2.8)**	**0.01**
Current Place for Living	Inside	1	1	1
	Outside	2.1 (1.2–4.1)	3.0 (0.3–7.1)	0.4
Department by Choice	No	1	**1**	
	Yes	0.7 (0.4–0.9)	**0.6 (0.3–0.8)**	**0.01**
Prior English & Basic Science Knowledge	Good	1	**1**	
	Medium	3.8 (0.8–6.0)	2.9 (0.9–6.0)	0.8
	Poor	2.8 (1.5–4.4)	**2.1 (1.4–4.1)**	**<0.0001**
Presence of Stress and Anxiety	No	1	1	
	Yes	8.9 (4.0–15.7)	4.2 (1.8–9.5)	0.4
Parental Support	Good	1	**1**	
	Poor	2.6 (1.4–4.6)	**2.1 (1.3–3.7)**	**0.02**
Harmonious Relation with Students/ Teachers	No	1	1	
	Yes	0.7(0.5–1.2	0.6 (0.4–1.1)	0.1

Female students with poor prior knowledge in English and basic science are more likely to face academic challenges. This finding is supported by other studies [24,25], which also demonstrate that a lack of foundational skills in key subjects can hinder academic progress and overall performance. The likely reason for these findings is that English proficiency is essential for understanding instructions, reading materials, and effectively communicating in many academic settings. Similarly, a strong foundation in basic science provides critical thinking and problem-solving skills that are applicable across subjects. When female students lack prior knowledge in these areas, they may struggle to keep up with the curriculum, leading to increased academic challenges. Educational institutions may need to implement targeted support programs, such as remedial courses or tutoring in English and basic science, to help students with weaker backgrounds. Addressing these gaps early on can enhance their academic performance and improve retention rates. Additionally, these findings suggest the importance of strengthening English and science education at the foundational levels to prevent academic struggles in higher education.

Students who did not have a department of interest were more likely to struggle with achieving good academic performance compared to those engaged in a department that aligned with their interests. Similarly, other studies have found the same results [27,28]. Students who do not have a department of interest are more likely to struggle with their academic performance compared to those engaged in a field that aligns with their passions. This lack of interest can reduce motivation and engagement, leading to poor academic performance. It can also result in feelings of frustration and stress. To address this issue, schools should offer better career guidance to help students choose fields that match their interests. Additionally, developing a curriculum that includes diverse topics and support programs can enhance student engagement. Raising awareness about the importance of following one's interests can also help students make better academic choices, ultimately improving their performance.

Inadequate parental support increases the odds of poor academic performance, making students more likely to struggle compared to their peers with strong support. This finding is consistent with other studies [29–31]. This is largely because students without adequate support often lack essential emotional encouragement, which is crucial for navigating the challenges of higher education. Additionally, they may miss out on important resources, such as guidance in managing coursework and study habits, which can hinder their ability to succeed. Without parental guidance in making informed decisions about their studies and career paths, they may feel lost and unmotivated, further contributing to their struggles. To address this issue, universities should implement programs that actively engage parents and provide them with resources to support their children academically. Offering counseling services can also help students who lack parental involvement. Furthermore, organizing workshops can educate parents about the vital role they play in their children's education. Creating a community network can provide extra support for students in need, ultimately improving their academic outcomes. The limitation of the study includes the potential for social desirability bias due to the self-administered data collection method, where participants may have underreported or overreported certain factors to align with social expectations. Additionally, the cross-sectional design of the study limits the ability to make direct causal inferences, as it only captures data at a single point in time, preventing the establishment of cause-and-effect relationships.

Conclusion

The findings of this study underscore the multifaceted challenges affecting female university students' academic performance. Quantitative results identified key factors, including alcohol consumption, smoking, working after school, department choice, prior knowledge in English and basic science, and insufficient parental support. The relationship between smoking and academic performance is likely influenced by psychosocial factors such as stress and anxiety, which may drive individuals to smoke as a coping mechanism. While smoking can be associated with temporary improvements in alertness due to nicotine's stimulating effects, the long-term consequences are detrimental to overall cognitive health. Therefore, exploring the root causes of smoking is fundamental to understanding its relationship with academic performance.

Meanwhile, qualitative insights shed light on significant barriers such as the lack of protective rules against harassment, experiences of violence, inadequate institutional support systems, socio-cultural influences, menstrual symptoms, and the psychological impact of being placed in undesired departments. Addressing these issues requires a comprehensive approach. Universities should implement targeted interventions, such as creating robust harassment prevention policies, offering assertiveness training, providing regular tutorials and counseling services, facilitating informed department choice, and enhancing parental engagement. By integrating academic, social, and institutional support, these strategies can collectively improve the academic outcomes and well-being of female students.

Ethical consideration and consent

Ethical clearance was obtained from the Aksum University College of Health Sciences Institutional Review Board, and official permission was secured from Aksum University. Respondents were informed about the purpose of the study, and data were collected only after obtaining written informed consent from each participant. Information was recorded anonymously, ensuring that confidentiality was maintained throughout the study period. Additionally, we implemented safeguards to protect participants, particularly concerning sensitive issues like sexual harassment, to enhance the ethical rigor of our research.

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CRediT authorship contribution statement

Tsiyon Birhanu Wube: Writing – review & editing, Writing – original draft, Supervision, Software, Resources, Methodology, Formal analysis, Data curation, Conceptualization. **Solomon Gebremichael Asgedom:** Writing – review & editing, Writing – original draft, Supervision, Software, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Zelalem Mohammed Jemal:** Writing – review & editing, Writing – original draft, Supervision, Methodology, Formal analysis, Data curation, Conceptualization. **Lielt Gebreselassie Gebrekirstos:** Writing – review & editing, Writing – original draft, Supervision, Software, Resources, Investigation, Formal analysis, Data curation.

Declaration of competing interest

There is no financial and nonfinancial conflict of interest.

Data availability

Data are available upon reasonable requests.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.gloepi.2024.100175.

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