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Journal of Science and Sustainable Development (JSSD)

The International Journal of Ambo University

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Journal of Science and Sustainable Development (JSSD) Ambo University

Ambo University which was founded in 1939 is one of the oldest higher learning institutions in Ethiopia. The primary objective of the University is to promote and advance academics and research in all aspects of sciences to contribute to the sustainable development of the country. Among the various ways of promoting academics and disseminating research outputs are publishing the **JSSD, Ambo University Newsletter, various books and proceedings**. Ambo University is known for frequently organizing international conferences, workshops and public speeches as means of promoting academics and research ultimately contributing to better understanding of new and available technologies at local, regional and international level. Financial support for various researches being conducted by the University staff is provided by the ministry of education and other external funding agencies such as Ethiopian Institute of Agricultural Research (EIAR), Ministry of Science and Technology (MoST), Institute of Biodiversity Conservation (IBC), International Livestock Research Institute (ILRI), private agencies such as Agri-share Ethiopia. Ambo University, therefore, would appreciate and acknowledge all article contributors, financial assistance providers, and reviewers showing willingness to contribute for the sustainable publication of this imperative journal.

The current, biannual journal and the quarterly newsletter exist to advance scholarly discourse about scientific research, academic knowledge and extracurricular activities taking place in the University as well as in other scientific institutions. The journal considers articles from a wide variety of interest areas and from a wide spectrum of disciplines. Manuscripts are usually reviewed within one-to two months of submission. It is not possible to promise automatic acceptance of the manuscript. Based on the reviewers' comments, the Editorial Board deserves the right to reject manuscripts that are not up to standard. Authors are advised to strictly follow the *instructions for authors* as a mere deviation from the basics of the Journal format can lead to automatic rejection of the manuscript without going in depth into it.

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- To produce a publication that is credible and informative which will serve as a medium for professionals in science and related fields to interact and share information and knowledge for the purpose of the advancement of the scientific community and sustainable development.
 - To promote the effective teaching of science, technology and management; identifying problems and developing solutions through dissemination of new information from researches align in the direction of solving the basic need of the country.
 - To contribute to the pool of scientific information by providing (creating) more access for researchers to have their original scientific work relevant to the need of the country and the world at large.
-

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Introduction

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Materials and Methods should be complete enough based on laid down standard procedures for science, arts, and social research that allow trials/surveys/experiments to be reproduced. Detailed information should be provided on design, sampling population/techniques and data analysis procedure. However, only truly new procedures should be described in detail; previously published procedures should be cited, and important modifications of published procedures should be mentioned briefly. Capitalize trade names and include the manufacturer's name and address. Subheadings should be used. Methods in general use need not be described in detail.

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Acknowledgments

In the articles to be submitted to JSSD, the authors should acknowledge individuals, organizations, or institutions that contributed to the research or manuscript but do not meet the criteria for authorship. This include acknowledgements of people, grants, funds, etc. should be as brief as possible.

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Legends for figures and tables should be presented in numerical order. Use Arabic numerals to number figures and tables, and uppercase letters to label their parts (e.g., Figure 1). Each legend should start with a title and provide enough detail for the figure or table to be understood independently of the manuscript text. Do not repeat information from the legends within the main text. Graphics should be prepared using applications capable of generating high resolution GIF, TIFF, JPEG or PowerPoint before pasting in the Microsoft Word manuscript file. Tables should be prepared in Microsoft Word. Tables, Figures and their legends are preferably to be embedded in the text on appropriate places.

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- Abayomi (2000), Agindotan *et al.* (2003), (Kelebeni, 1983), (Kumasi *et al.*, 2001), (Usman and Smith, 1992), (Chege, 1998; Chukwura, 1987a,b; Tijani, 1993,1995)

References should be listed at the end of the paper in alphabetical order. Articles in preparation or articles submitted for publication, unpublished observations, personal communications, etc. should not be included in the reference list but should only be mentioned in the article text (e.g., A. Kingori, University of Nairobi, Kenya, personal communication). Journal names are abbreviated according to American Psychological Association (APA). Authors are entirely responsible for ensuring the accuracy of their references and must carefully follow the APA referencing style as shown below:

Journal articles

- Chikere, C. B., Omoni, V. T. & Chikere, B. O. (2008). Distribution of potential nosocomial pathogens in a hospital environment. *African Journal of Biotechnology*, 7, 3535-3539.

- Moran, G. J., Amii, R. N., Abrahamian, F. M. & Talan, D. A. (2005). Methicillinresistant *Staphylococcus aureus* in community-acquired skin infections. *Emerg. Infectious Diseases*, 11, 928-930.
- Pitout, J. D. D., Church, D. L., Gregson, D. B., Chow, B. L., McCracken, M., Mulvey, M. & Laupland, K. B. (2007). Molecular epidemiology of CTXM-producing *Escherichia coli* in the Calgary Health Region: emergence of CTX-M-15-producing isolates. *Antimicrobial Agents for Chemotherapy*, 51, 1281-1286.

Books

- Pelczar, J. R., Harley, J. P. & Klein, D. A. (1993). *Microbiology: Concepts and Applications*. McGraw-Hill Inc., New York, USA.
- Creswell, J. W., & Poth, C. N. (2018). *Qualitative inquiry and research design: Choosing among five approaches* (4th ed.). Sage Publications, USA.

Edited Book chapters

- Medley, D. M. (1983). Teacher effectiveness. In H. E. Mitzel (Ed.), *Encyclopedia of educational research* (pp. 1894-1903). New York: The Free Press, USA.
- Davis, P. K. & Rehfeldt, R. A. (2007). Functional skills training for people with intellectual and developmental disabilities. In J. K. Luiselli, J. A. Matson & F. R. Volkmar (Eds.), *Handbook of intellectual and developmental disabilities* (pp. 581-599), Springer.

Thesis/ Dissertations

- Gezahegn, Y. B. (2007). *Barriers to teaching and learning mathematics in grade four*. Masters Thesis, University of Oslo, Norway.
- Weldeab, C. T. (2006). *Family, school, and community: Challenges in raising and educating children with intellectual disability: A case study among parents, teachers, and social workers in Ethiopia*. Doctoral dissertation, University of Oslo, Norway.

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Analyzing the Teaching of Mathematics to Students with Blindness in Ethiopia in Reference to the Existing Policies and Programmatic Frameworks Context

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Abstract

Mathematics is widely recognized as a foundational subject that develops critical thinking and problem-solving skills, which are essential for academic, personal, and professional development. Despite mathematics' immense global significance, blind students in Ethiopia have experienced discriminatory practices in learning the subject. The study aimed to investigate the reasons behind the inaccessibility of mathematics to blind students, taking into account Ethiopia's educational policies and relevant programmatic frameworks. A qualitative design, with phenomenological elements and case studies, was employed. The study involved a total of fifteen key informants. Nine education experts, a disability advocate and six professionals with blindness were selected through purposive and snowball sampling techniques, respectively. Semi-structured face-to-face interviews were used to generate the data, which were then subjected to thematic analysis. The results demonstrate that although Ethiopian policies support inclusive teaching approaches, challenges pertinent to teacher training programs and the under-utilization of assistive technology have led to the exclusion of blind students from mathematics classes. These difficulties were made worse by historical customs and the expulsion of foreign missionaries after the 1974 revolution. The study emphasizes how this exclusion affects blind people's self-confidence, professional opportunities, and access to higher education study choices. Among the suggestions are integrating assistive technologies to support inclusive mathematics, enhancing the role of organizations of people with disabilities, establishing individualized education plans, and mainstreaming disability-inclusive pedagogy in pre- and in-service teacher training programs. The study underscores the importance of adopting the social and rights-based models of disability to address attitudinal barriers and ensure equitable access to mathematics for students with blindness in Ethiopia.

Keywords: Blindness, Mathematics, Inclusive Education, Assistive-Technology, Social and Right-Based Model of Disability

Introduction

Mathematics has become essential for participation in daily life, employment, and national development in today's knowledge-driven and digitally interconnected world. Studies indicate that classifying direction, quantity, shape, and logical attributes is at the core of mathematics, allowing students to develop critical problem-solving and reasoning skills. This is especially true when it comes to

the application of mathematical knowledge and skills (Dick *et al.*, 2025; Zhang, 2016). Like many other nations, Ethiopia understands the importance of mathematics in creating a workforce that is competitive and attaining sustainable development. As a result, mathematics is required in elementary and secondary school. However, systemic, pedagogical, and attitudinal barriers continue to severely limit the access of blind students to

mathematics education (Milki, 2025; MoE, 2016).

Research shows that students with blindness and visual impairments encounter challenges in terms of factors such as inaccessible learning resources, lack of specially trained teachers, and insufficient application of assistive technology (Driscoll and Watson, 2014; Zhang, 2016). Studies across multiple countries have found that, although innovations such as tactile devices, Braille textbooks, and digital assistive technology have helped improve access, there are still inequities in students' participation in mathematics as a result of weak teacher education and systemic support.

In African and Sub-Saharan regions, educating students with blindness and visual impairment (BVI) involves many continuing challenges. These issues are made worse by negative attitudes, lack of resources, and poor infrastructure. Educational leaders in several African countries are uncertain about the ability of students with blindness to learn and succeed in mathematics (UNESCO, 2018). Although low-cost and affordable tools like Braille slates and styluses are common, they do not effectively support broad mathematics instruction. This is particularly true for complex concepts that need tactile diagrams, mathematical symbols, and hands-on learning (Mwakyēja, 2013; Ncube, 2020). Research in South Africa, Zambia, and Senegal reveals that the lack of tailored teaching materials, such as tactile rulers, abacuses, and raised mathematical graphics, along with inadequate teacher training in inclusive methods, greatly interferes with successful mathematics learning for students with BVI (Chataika *et al.*, 2012; Foko, 2020; Maphosa and Ndhlovu, 2019).

These educational challenges are closely connected to larger socio-economic issues for people with blindness. Inadequate access to worthwhile mathematics education restricts opportunities for further education, professional training, and contribution in science, technology, engineering, and mathematics (STEM) fields. These areas are key pathways to economic empowerment in today's economies (UNESCO, 2018). As a result, many

people with disabilities in Africa face higher unemployment, underemployment, and reliance on informal or subsistence-level jobs (Leibbrandt and Mlatsheni, 2015). This economic marginalization often traps people in cycles of poverty, limits access to healthcare, and reduces social mobility, which deepens dissimilarity. In Sub-Saharan Africa, where poverty rates are some of the highest in the world, the exclusion of students with blindness and visual impairment from fair mathematics education not only deteriorates individual potential but also hinders national human capital development and novelty (Chimhenga, 2016; World Bank, 2022). The combination of these educational and socio-economic barriers shows the pressing need for policies that include accessible teaching methods, assistive technologies, and focused teacher training. These changes are indispensable to break the cycle of exclusion and marginalization of people with blindness in the region.

Historically, Ethiopia achieved early successes in mathematics education for persons with blindness. During the first decade of Emperor Haile Selassie's restoration, the United Presbyterian Missionaries of North America set up residential schools for the blind, introduced Braille, and taught mathematics from grades 1 to 12 using tactile instruments. Nevertheless, progress was slowed down by the military regime after 1974. This led to the expulsion of missionaries and the ongoing exclusion of persons with blindness from mathematics. It also restricted their ability to participate meaningfully in society, access career opportunities, and enroll in higher education institutions (Sissay, 2022).

While Ethiopia backtracked in upholding the educational and other rights of people with disabilities, including those who are blind, the international community was advancing. Scholars, disability rights advocates, and UN agencies began to promote a new idea: Disability isn't a personal issue; it's a problem within the society. Inspired by the social model of disability, thinkers like Oliver (2013) argued that the main barriers for people with disabilities come from inaccessible systems, biased policies, and old attitudes. The question

changed from "How can people with disabilities adjust?" to "Why won't society change?"

To meet the specific needs of learners with disabilities, including those with blindness, Ethiopia has made imperative development in supporting inclusive education. The Ethiopian government has made advances through policy changes like the 1994 Constitution, the Education and Training Policy (1994 and 2018), the Special Needs/Inclusive Education Strategy (2006, 2012, & 2022), and the Inclusive Education Master Plan (2016). However, the execution of these policies varies. Article 41(3) of the Constitution guarantees equal access to public services. Additionally, Ethiopia's ratification of the UN Convention on the Rights of Persons with Disabilities (CRPD) (2006) confirms the country's legal commitment to inclusive education. However, the experiences of students with blindness, particularly in STEM subjects like mathematics, show significant exclusion. The Master Plan for Special Needs/Inclusive Education (2016–2025) offers promises for adapting the curriculum, using flexible teaching methods, and incorporating assistive tools like Braille, tactile models, and audio-based learning. Nevertheless, these commitments have not become common in practice.

Studies prove that teachers play a key role in unlocking every child's potential, especially for students with disabilities. They don't just deliver lessons; they adjust their methods and make sure no learner is left behind. Effective teaching, especially for students with blindness, requires adapting the curriculum, using appropriate teaching methods, and applying assistive technologies. Recognizing this, Ethiopia's 10-Year Master Plan focused on teacher training, giving educator skills like curriculum adjustment and inclusive teaching strategies because a policy is only as good as the teachers who implement it (MoE, 2016).

Nevertheless, studies in Ethiopia show that teachers often don't have enough knowledge of Braille and suitable teaching strategies (Golga and Kana, 2024; Yohannes, 2007). For example, the study according to (Gasa and Negash,

2022) reported that students having no access to Braille-based mathematics resources or teacher support, which impacts their learning outcomes. Dawit and Fituma (2023) highlighted that many educators had hesitation about whether students with blindness can learn math through Braille, which led to their exclusion from STEM subjects.

Existing Ethiopian studies on Braille and mathematics education provide valuable insights but leave numerous gaps. While these studies have explored broader Braille literacy, the lived experiences of students with blindness, and barriers in mainstream schools (Dawit, and Fituma 2023; Gasa and Negash, 2022; Golga and Kana, 2024), none have focused explicitly on mathematics teaching, the importance of teacher training in Braille mathematics, or the availability and use of Braille-specific mathematical resources. Other studies broadly address inclusion challenges but sidestep the specific crisis in mathematics accessibility (Asmerom and Fituma, 2024; Mulat and Silesh, 2020). Even Yohannes' (2007) work on mathematics pedagogy gaps never clarified whether students with blindness were part of the study. There is also inadequate research assessing how well policies are implemented to facilitate mathematics education for blind students.

The present study was meant to confront these oversights. This study made its center on the factors contributed to the inaccessibility of mathematics to students with blindness while it has been supported by the country's education policy and other relevant programmatic documents. In the courses of data collection and analysis, more focus was given to the inclusive education Master Plan which was ought to be implemented from 2016 to 2025 and the lived experiences of professionals with blindness. This study wasn't just for academic purpose; it's about dismantling systemic bias and ensuring the next generations of Ethiopians with blindness aren't denied opportunities their peers take for granted. Furthermore, the study contributes to the literature by examining the systemic and institutional factors that influence persons with blindness mathematics education, situating the Ethiopian experience within

broader global and African contexts. Understanding these dynamics is crucial to developing strategies that ensure equitable learning opportunities for blind students, enhancing their problem-solving skills, and supporting their full participation in society.

Based on these veracities, the study aspired to answer the following basic questions:

1. What, if any, written policies or practices have historically limited the access of mathematics education to students with blind?
2. What institutional initiatives currently exist to facilitate mathematics learning for students with blindness in Ethiopia?
3. How do government authorities in the education sector perceive the capacity of blind students to learn mathematics?
4. What lessons can be drawn from past experiences and success stories of blind learners in mathematics?
5. What strategies or interventions are needed to transform existing exclusionary practices and ensure equitable access to mathematics education for blind students?

Materials and Methods

Research Design

This study employed a qualitative case study design with phenomenological elements, which is particularly suitable for exploring the lived experiences, institutional practices, and policy implementation related to teaching mathematics to blind students in Ethiopia (Creswell and Poth, 2018; Yin, 2018). Case studies enable an in-depth examination of contemporary phenomena within their real-life contexts, particularly where boundaries between the phenomenon and context are not clearly defined. Phenomenological elements were incorporated to capture the personal experiences of blind professionals, providing insights into the successes and challenges they encountered in learning mathematics. The qualitative approach was chosen over quantitative or mixed-method designs since the

study seeks to explore complex social processes, attitudes, and practices, which cannot be effectively quantified. The design aligns directly with the research questions, which focus on policy implementation, institutional endeavors, teacher perceptions, historical experiences, and strategies to improve mathematics education for blind students.

Study Setting

The study was conducted in multiple administrative regions in Ethiopia, including the Addis Ababa city administration, Oromia, the Southern Nations, Nationalities, and People's Regional States. These regions were selected for the fact that they were relatively more peaceful than the other regional States in Ethiopia during the data collection period. Besides, most of the residential schools for the blind were situated in these settings.

Study Participants

The informants of the study were experts from Special Needs and Inclusive Education and Teachers and School leaders' development working in the Federal Ministry of Education, Addis Ababa City Administration, Oromia, the South Nation, Nationalities, and Peoples Regional States Education Bureaus. The Special Needs and Inclusive education experts are responsible to formulate Special Needs and Inclusive Education programs and strategies to facilitate the inclusion of all school age children in educational settings while the expertise in the teachers and school leaders 'were responsible for teacher training in pre- and in-service modalities and teachers' capacity building. Disability advocates from the Ethiopian National Association of the Blind (ENAB) and professionals with blindness were another set of the study participants.

Sample Size and Sampling Methods

A total of fifteen participants were included in the study. They comprised special needs and inclusive education experts and teacher and school leaders development experts working at the Federal Ministry of Education and Regional

or City Education Bureaus, Disability movement advocates, selected from the Ethiopian National Association for the Blind (ENAB), were included for their expertise and historical knowledge of the suitable strategies for students with blindness as well as the roles they have for promoting the right to an inclusive educational approach for persons with blindness.

Additionally, professionals with blindness who experienced success and challenges in learning mathematics education and currently serve in professional roles were included to provide insights into their lived experiences. Purposive sampling was used to select participants from the Ministry of Education, city and regional education bureaus, and ENAB, ensuring information-rich cases relevant to the study objectives (Palinkas *et al.*, 2015). Snowball sampling was employed to recruit blind

professionals, as they represent a hard-to-reach population; initial participants referred others with relevant experiences. The combination of these methods strengthens the link between policy-level insights and experiential knowledge, enhancing the study’s comprehensiveness.

Sample Size and Profile

The participants from education institutions and advocacy organizations (Table 1) included experts from the Ministry of Education, Addis Ababa, Oromia, South Nations Nationalities and Peoples’ Regional States Education Bureaus, and an advocacy officer from ENAB. Their roles encompassed special needs education and teacher development expertise with qualifications ranging from BA to MA and professional experience spanning eight to thirty years.

Table 1. Profiles of Education Experts and Advocates who shaped this study

Institution	Role	Gender	Age	Education	Years of Experience
Ministry of Education	Special Needs Expert	Male	48	MA	19
	Teacher Development Expert	Male	46	MA	8
Addis Ababa Education Bureau	Special Needs Expert	Male	34	MA	16
	Teacher Development Expert	Male	47	MA	21
	Special Needs Expert	Male	52	MA	31
Oromia Education Bureau	Teacher Development Expert	Male	47	MA	29
SNNP Region Education Bureau	Special Needs Expert	Male	53	MA	33
	Teacher Development Expert	Male	51	MA	30
Ethiopian Nat’l Assoc. of the Blind	Advocacy Officer	Male	58	BA	37

The following thematic summary of interviews with education experts and advocates (Table 2) indicated the gaps between policy intentions and actual implementation, perceived teachers misconception that mathematics is only for those without blindness, how lack of

appropriate training affected educational services to students with blindness, and the inability to utilize the available resources due to factors attached to knowledge, skills, attitudes and stereotypes.

Table 2. Thematic Summary of Interview Insights from Education Experts and Advocates

Theme	Sample Participant Quote	Institution / Role
Policy–Practice Gap	“We write inclusive policies, but teachers never get the braille and tactile tools to implement them.”	Ministry of Education – Special Needs Expert
	“Without braille textbooks, policies are just poetry.”	SNNP Education Bureau – Special Needs Expert
Teacher Misconceptions About Blindness	“Most math teachers still believe blindness = inability to calculate. Training = None, Support = None.”	Ministry of Education – Teacher Development Expert
	“Teachers fear inclusive math because they were never taught how.”	Oromia Education Bureau – Teacher Development Expert
Lack of Training and Professional Support	“Training? None. Follow-up support? None.”	Addis Ababa Education Bureau – Teacher Development Expert
	“We’ve never trained teachers in methods to teach math to students with blindness.”	SNNP Education Bureau – Teacher Development Expert
Resource Shortages	“The city has resources, but students are forgotten.”	Addis Ababa Education Bureau – Special Needs Expert
	“I’ve fought for tactile math tools since the 1990s. Progress is glacial.”	Oromia Education Bureau – Special Needs Expert
Advocacy and Personal Experience	“I scored top in math class. Now they tell blind kids it’s impossible to learn mathematics. Why?”	Ethiopian National Association of the Blind – Advocacy Officer

The study also included six pioneering Ethiopian professionals with blindness (Table 3) whose lived experiences span multiple decades of educational and advocacy work. These participants, aged between 53 and 79 years, held either bachelors or master’s degrees and had between 30 and 48 years of professional experience, totaling 243 combined years of service. Their careers encompassed roles in inclusive education advocacy, teaching,

lecturing, and advising within governmental, non-governmental, and academic institutions. Having personally experienced both inclusion and exclusion from mathematics education at various stages of their schooling, they offered powerful first-hand accounts of how systemic barriers, teacher attitudes, and instructional practices shaped their academic and professional trajectories.

Table 3. Profiles of Professionals with Blindness

Institution	Role	Age	Gender	Education	Years Working
Together for Inclusion	Officer	78	Male	BA	48
Yemisirach Center	Advisor	72	Male	BA	43
(Former) Primary School	Retired Teacher	79	Male	BA	54
(Former) Primary School	Retired Teacher	66	Male	BA	36
National Association of the Blind	Inclusion Expert	57	Male	BA	32
College of Teacher Education	Lecturer	53	Male	MA	30

Age as evidence

Participants’ age (Table 3) ranged from 53 to 79. Key informants aged 78 and 79 were those who had the opportunity to learn mathematics as a compulsory subject during the imperial government (before 1974) by the missionaries from North America. The key informant, aged 72, has never experienced mathematics learning. Key informants aged 53-66 did not have uniform experiences. A key informant with age 53 has begun learning mathematics on abacus but meanwhile, was forced to drop the subject by mathematics teacher of the non-boarding public school. The other two (57 and 66) had mathematics learning experiences up to grade 6 in a boarding school for the blind but were forced to drop the subject by the

mathematics teacher of grade 7 when they went to the nearby government school. This has proven that the exclusion is not new; it’s a generational systemic failure (from 1974 to date).

The following thematic analysis (Table 4) organizes participants’ lived experiences into five major themes reflecting systemic and pedagogical challenges: policy-practice gaps, inaccessibility of mathematics, impact on socio-economic opportunities, teacher preparedness, and the need for assistive technologies. These themes highlight both the structural barriers and the personal consequences faced by students with blindness in accessing mathematics education.

Table 4. Themes and Illustrative Quotes from Professionals with Blindness

Theme	Illustrative Quote
Policy-Practice Gap	“Policies say inclusion is a right, but in mathematics classrooms, students with blindness are still invisible.”
Inaccessibility of Mathematics	“Without accessible materials, mathematics becomes a closed door to students with blindness future.”
Impact on Socio-Economic Opportunities	“If persons with blindness can’t learn mathematics, they are locked out of many professions, career opportunities, access to higher education their interest field of study at the higher education institutions; and even basic financial management.”
Teacher Preparedness	“Most teachers have good intentions but lack the skills and tools to teach mathematics to blind students.”
Need for Assistive Technologies	“Even a simple talking calculator could change our learning experience, but such tools are rare and teachers’ possess no ability to operate the device because they have no knowledge and skills to do so”

Data Collection tool

Face-to-face semi-structured interviews were used for data collection, as this method allows the researchers to explore issues in depth while

maintaining alignment with research objectives (Creswell and Poth, 2018). Interviews with education experts focused on policy implementation, institutional practices, and teacher preparation, whereas interviews with blind professionals explored their personal experiences in learning and using mathematics, including successes and challenges encountered. Interviews were conducted at locations convenient for participants and lasted between sixty and ninety minutes. All interviews were audio-recorded with participant consent and stored securely. Participants were assured of anonymity, confidentiality, and the right to withdraw from the study at any time. The researchers served as human readers during interviews with participants with blindness to ensure comprehension and accurate data capture.

Ethical Considerations

Ethical approval for the study was obtained from the Institutional Review Board (IRB) at the department level, Addis Ababa University, College of Education and Behavioral Studies, Departments of Special Needs and Inclusive Education under approval code SNIE 143/GP/12, dated 24/08/2021. Participants provided informed consent, and confidentiality and anonymity were maintained throughout the research process. Ethical safeguards were particularly important given the inclusion of high-profile officials and professionals with blindness.

Data Analysis

Thematic analysis, following Braun & Clarke's (2006) guidelines, was employed to analyze the data. Data analysis began with familiarization through repeated reading of transcripts, followed by coding key ideas and recurring patterns. Codes were then grouped into preliminary themes, which were reviewed and refined for consistency and relevance. The final themes were defined, named, and interpreted in relation to the research questions and study objectives. Themes were organized to correspond with research questions, including institutional practices, policy implementation

gaps, teacher perceptions, and lived experiences of professionals with blindness.

Trustworthiness

Credibility was enhanced through member checking, allowing participants to verify the accuracy of interview transcripts. Triangulation was achieved by comparing interview data with policy documents and historical records. Dependability and conformability were ensured through a detailed audit trail, while transferability was supported by providing rich contextual descriptions (Guba and Lincoln, 1985).

Research Themes

The study identified four overarching themes. The first theme focused on the existing practices addressing blind students' mathematical needs according to relevant policy frameworks, including institutional undertakings promoting blind students' rights. The second theme explored education experts' understanding of teaching mathematics to blind students in the Ethiopian context. The third theme traced historical arguments and prohibitions that contributed to the exclusion of blind students from mathematics. The fourth theme addressed practical strategies for changing unlawful or traditional practices to improve access and inclusion in mathematics education.

Definition of Terms

Blindness refers to the total loss of sight, educationally identified as students using Braille as their primary reading and writing method.

Policy refers to any legal or strategic document developed or endorsed to address the educational needs of blind students.

Results

Existing Practices in Addressing the Special Educational Needs of Blind Students in Mathematics

Informants from the Federal Ministry of Education and regional/city education bureaus were asked to share their views on the major goals of primary education and the minimum learning competencies expected from students. They unanimously approved that reading, writing, computation, and the ability to utilize these skills in daily life are the minimum competencies required. Mathematics and English were recognized as compulsory subjects due to their essential roles in students' academic and professional futures. Despite this recognition, the informants highlighted a contradiction in current practice: blind students are frequently excluded from learning mathematics, which negatively affects their ability to achieve the expected learning outcomes at the completion of primary education.

When questioned about the existence of legal statements prohibiting blind students from learning mathematics, experts confirmed that no such documents exist. Instead, they emphasized that a lack of awareness and understanding among senior education leaders about the capacities of blind students, coupled with insufficient preparation of teachers to teach mathematics to this population, has led to the de facto exclusion of blind students from the subject. A special needs education expert from the Ministry of Education explained that repeated searches in official archives yielded no policy or law denying blind students the right to learn mathematics. Furthermore, the experts reported that no specific capacity-building programs had been provided to teachers in pre-service or in-service training to address the teaching of mathematics to blind students, despite the strategic objectives outlined in the federal Master Plan for inclusive education.

The study also explored the role of Inclusive Education Resource Centers (IERCs), which were established nationwide to support inclusive education. Respondents indicated that these centers are currently not supporting mathematics instruction for blind students because teachers lack training in the use of assistive devices and adaptive technologies available at these centers.

Institutional Efforts to Promote the Rights of Blind Students in Mathematics

Organizations of Persons with Disabilities (OPDs), including the Ethiopian National Association of the Blind (ENAB), have a mandate to promote the rights of their members, including access to education. However, interviews revealed that ENAB has not actively ensured that blind students have access to mathematics education. Similarly, SNE experts in the Ministry of Education and regional education bureaus acknowledged that while blind students are capable of learning mathematics and that mathematics is critical for academic and career advancement, institutional measures, including their respective bureaus, to support these students remain weak.

One expert noted that in the 1950s, blind students learned mathematics in schools established by missionaries, and this practice continued until the early 1970s. Following the fall of the imperial government in 1974, blind students' access to mathematics was largely confined to special schools up to grade six. Those integrated into regular schools were systematically excluded from learning mathematics, and the reasons for this exclusion were not formally investigated or addressed by educational authorities. All experts agreed that the current exclusionary practice contravenes both the United Nations Convention on the Rights of Persons with Disabilities (CRPD) and established pedagogical principles.

Education Experts' Understanding of Mathematics Instruction for Blind Students

General education experts in teachers' development programs reported that mathematics is perceived as a particularly challenging subject for blind students due to its reliance on visual instructional media. This perception influenced curriculum design, as adaptive teaching techniques were not incorporated into teacher education programs. Consequently, mathematics teachers in

inclusive classrooms are largely unprepared to address the needs of blind students.

Historical and Social Factors Influencing Exclusion

Experts, ENAB representatives, and blind professionals were asked to explain the historical factors behind the exclusion of blind students from mathematics education. Participants identified entrenched negative attitudes among decision-makers as informal yet influential barriers. One blind professional recalled learning mathematics only up to grade six in a residential school and then being forced to leave the school system that could support advanced mathematics learning. Upon entering a regular school, teachers discouraged further study in mathematics, claiming it was too difficult for blind students. Other informants noted that after the military government took power, foreign missionaries who had provided expertise and training in teaching mathematics to blind students were expelled, and their knowledge was not transferred to local teachers. This gap in teacher preparation and institutional knowledge significantly contributed to ongoing exclusion.

The consequences of this exclusion were evident in participants' lived experiences. Blind professionals who had not received mathematics education reported a lack of confidence in handling numerical tasks, feelings of helplessness, and restricted career choices, particularly being confined to social science streams. Conversely, those who had successfully learned mathematics from primary through secondary levels reported greater confidence in addressing numerical problems in professional and daily life, highlighting the critical role of access to mathematics education in self-efficacy and career advancement.

Practical Actions for Redressing Exclusion

Participants suggested several strategies to improve mathematics education for blind students. They emphasized the need to enhance teacher training programs to include adaptive and accommodative instructional methods, and

to mainstream disability issues within pre-service and in-service teacher education curricula. OPDs, particularly ENAB, should educate members about their rights to learn mathematics and actively advocate against discriminatory practices. Implementing Individual Education Plans, assistive technologies, and inclusive adaptive ICT were recommended as essential methodologies for supporting blind students. Finally, participants proposed organizing pilot programs in selected inclusive schools to demonstrate effective practices for teaching mathematics to blind students, providing a model that could be scaled nationwide.

Discussion

The findings of this study disclose a noteworthy gap between policy intentions and actual practice in teaching mathematics to blind students in Ethiopia. Despite having strong legal frameworks, such as the Ethiopian Constitution (1994), the UN Convention on the Rights of Persons with Disabilities (CRPD, 2006), and the Federal Ministry of Education's Master Plan for Special Needs Education (MoE, 2016), blind students still experience exclusion from mathematics instruction. This situation matches global evidence, showing that having inclusive policies alone does not ensure educational access for students with disabilities. Effective implementation needs structural, pedagogical, and attitudinal support (Al-Azawei *et al.*, 2016; Driscoll and Watson, 2014).

From the perspective of inclusive mathematics education, the study highlights that blind students can learn mathematics when they receive adaptive teaching methods, Braille materials, tactile tools, and assistive technologies. These findings align with research from both developed and developing areas, including sub-Saharan Africa, which indicates that learners with visual impairments can achieve similar mathematical results when adequately supported (Ali, 2019; Moyi, 2018). However, in Ethiopia, deep-rooted misconceptions about mathematics' visual nature and the lack of teacher training in adaptive teaching methods have resulted in

systemic exclusion. This reflects a trend that diverges from global best practices, where access and inclusion are increasingly seen as rights instead of privileges.

The historical review shows how institutional and social disruptions contribute to exclusion. In the mid-20th century, missionary schools effectively used Braille for math instruction up to secondary levels (Sissay, 2022). However, after the 1974 political shift and the expulsion of foreign educators, Ethiopian blind students faced a significant drop in access to mathematics education. This history shows that exclusion is not caused by students' abilities but by structural and attitudinal barriers within the education system. This idea is a key part of the social model of disability. According to this model, disability mainly comes from environmental and societal obstacles, not individual impairments (Oliver, 2013). In Ethiopia, the study indicates that high-level educational leaders, teachers, and institutions have maintained these attitudinal barriers by believing that math is unsuitable for blind students, which limits their access to the subject.

The findings also support the rights-based approach to disability. They emphasize that blind students should have equal access to educational activities, including mathematics, as a basic human right (CRPD, 2006). Excluding blind students from mathematics classes, regardless of their proven abilities, violates their fundamental rights and undermines the goals of inclusive education. Blind professionals interviewed in this study reported long-term effects of this exclusion, such as decreased confidence, fewer career options, and difficulties in higher education study choices. This aligns with global research showing that denying access to core subjects reduces educational and socio-economic opportunities (Driscoll and Watson, 2014; Zhang, 2016).

A key contribution of this study is the definition of the attitudinal barrier as a main factor in the exclusion of blind students from math education. While there are structural and policy frameworks, attitudinal barriers, such as

negative views of blind students' abilities, teachers' lack of knowledge about adaptive methods, and institutional reluctance, serve as the main reason for exclusion. This supports social and rights-based models, which assert that educational inequities are socially created and need targeted interventions to change. Therefore, the study advances theory by showing how policy, teaching methods, and attitudes interact to shape access to mathematics education for blind students in Ethiopia.

The study findings align with research from Africa that emphasizes the importance of teacher preparedness and attitudes in making inclusive education work (Moyi, 2018; Sissay, 2022). However, these findings differ from what Ethiopian policies suggest. The policies imply that having inclusive education frameworks is enough to guarantee access. The findings of this study demonstrate that merely having legal recognition is not enough. Without changes in attitudes and practical steps like adaptive curricula, assistive technologies, and teacher training, blind students continue to be left out of essential subjects like mathematics.

The study highlights several actions for policy and practice. First, teacher training programs should include inclusive mathematics teaching methods, focusing on adaptive techniques, assistive technology, and individualized education plans. Second, the Ethiopian National Association of the Blind (ENAB) and other disability organizations should be supported in advocating for the rights of blind students, raising awareness, and tackling discrimination. Third, education authorities should oversee policy execution and create supportive structures, such as Inclusive Education Resource Centers, to promote fair mathematics learning. Finally, pilot programs that successfully teach mathematics to blind students can act as examples for expanding these practices across the country.

Conclusion

This study shows that, even with strong legal and policy support for inclusive education in Ethiopia, blind students still face systemic

exclusion from mathematics instruction. The findings point out that the main barriers are attitudinal, structural, and pedagogical, not based on the students' abilities. This is backed by the lived experiences of professionals with blindness who successfully navigated mathematics education from primary through secondary grades. Misunderstandings about the adaptability of the visual aspect of mathematics, inadequate teacher training, a lack of adaptive materials, and historical disruptions have limited blind students' access to the subject. The experiences of education professionals and blind individuals highlight that exclusion has real socio-economic effects, such as lower educational achievement, fewer career opportunities, and decreased confidence in numerically associated activities.

The study contributes to our understanding by stressing the importance of attitudinal barriers in determining access to mathematics. It adds to social and rights-based models of disability that place inequities in social structures instead of individual impairments. Similarly, the findings are consistent with regional and global research about the importance of teacher training, adaptive and tailored teaching methods, and inclusive practices. The findings also reveal a gap between what Ethiopian policies aspire and what actually happens in practice.

On a practical level, the study emphasizes the urgent need for thorough teacher training in inclusive mathematics teaching, access to Braille and tactile learning tools, empowering advocacy groups like ENAB, and creating supportive monitoring and resource systems. Pilot programs that show successful instruction for blind students could serve as models for wider implementation across the country. In general, the study corroborate that achieving inclusive mathematics education in Ethiopia necessitates targeted efforts to implement policy, adapt teaching methods, and attitudes, in order for students with blindness fully exercise their educational and socio-economic rights.

Recommendations

Teacher Education and Capacity Building: Both pre-service and in-service training programs should include inclusive mathematics teaching methods for students with blindness. They should focus on Braille instruction, adaptive teaching tools, and personalized support.

Policy Implementation and Monitoring: Educational authorities must put inclusive policies into action. They need to ensure compliance at both the classroom and institutional levels, while also establishing ongoing monitoring and evaluation systems.

Provision of Resources: Schools should have accessible mathematics materials, tactile tools, assistive technologies, and inclusive learning environments to effectively support blind students.

Attitudinal Change and Advocacy: Awareness campaigns should target misconceptions about the abilities of blind students in mathematics. Organizations of Persons with Disabilities, especially ENAB, should be strengthened to actively advocate for inclusive practices.

Pilot Programs and Research Integration: Demonstration projects that implement inclusive mathematics education should be tested in selected schools. These projects can showcase best practices and guide changes in national policy.

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Conflict of Interest

Authors disclose that there is No Conflict of Interest

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Authors contributions

Tsegaye Gerba Milki was responsible for reviewing the existing literature and developing the introduction section of the study. He also designed the research methodology, prepared appropriate data collection tools and mechanisms, and conducted the data analysis. Furthermore, he played a leading role in compiling and writing up the overall research report. *Belay Hagos Hailu* served as the main advisor of the research, reviewing the structure and framework of the study and providing insightful feedback on the final write-up, which greatly enhanced the quality of the research. *Abebe Yehualawork Malle* acted as the co-advisor of the study and served as the proofreader for the entire document, ensuring the accuracy, coherence, and clarity of the final research report.

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Assessment of Work-Life Balance of Female Academic Staff: Exploring Challenges and Coping Strategies- A Case Study on Ambo University

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Abstract

Maintaining a balance between personal and professional life is important for professionals, including academics. Work-life balance helps in achieving and sustaining a healthy work routine that enhances an academic's effectiveness and satisfaction. This study aimed to assess the work-life balance of female academic staff at Ambo University, focusing on the challenges they face and the coping strategies they adopt. The research involved 120 female academic staff across four campuses of the university. Both primary and secondary data sources were used. The data were analyzed using descriptive analysis methods. The findings highlight a range of challenges experienced by female academics, spanning professional, emotional, and personal domains. Professional challenges include difficulties in maintaining professional networks, updating expertise, and advancing their careers. On a personal level, managing dual responsibilities of professional and personal duties intensifies their workload, leading to dissatisfaction and emotional strain. The excessive time spent on house chores, inclination towards family responsibilities at the expense of professional responsibility, worry about work when not actually at work, low support levels from supervisors and subordinates, and personal and professional related factors are major challenges for female academic staff work-life balance. The study found that female academics use various coping strategies to manage their demanding schedules, including time management, prioritization, seeking support, outsourcing, and making personal sacrifices. The study's findings have important implications for university administrators, policymakers, and society. Academic institutions need to cultivate a supportive environment that recognizes the importance of family responsibilities. This study also has implications for Governments to collaborate with universities to design policies that recognize the additional emotional and caregiving burdens often placed on women, ensuring fair workload distribution and career advancement opportunities.

Keywords: Challenges; Coping Strategies; Female academic staff; Work-life Balance

Introduction

Work-life balance (WLB) has become a central concern in contemporary workplaces as employees increasingly struggle to manage professional demands alongside personal and family responsibilities (Lakshmi and Prasanth 2018). Rapid technological change, intensified workloads, and blurred boundaries between

work and non-work domains have made achieving sustainable balance more challenging. Empirical evidence consistently shows that poor work-life balance leads to stress, burnout, reduced job satisfaction, and lower productivity. In contrast, effective balance enhances well-being, work engagement, and overall quality of life (Haar *et al.*, 2019).

Conceptually, work–life balance refers to an individual’s perception of compatibility between work and non-work roles and the ability to allocate time and energy across these domains in line with personal priorities (Hasib *et al.*, 2022; Kalliath and Brough, 2008). Rather than implying equal time allocation, WLB emphasizes satisfaction, harmony, and the absence of excessive conflict between work and personal life (Bulger, 2014; Gervais, 2016). Both individual characteristics, such as gender, family responsibilities, values, and time-management skills, and organizational factors, including workload, job autonomy, leadership practices, and institutional support, significantly influence employees’ work–life balance (Brough and Biggs, 2020; Goh *et al.*, 2022; Greenhaus and Allen, 2012).

Work–life balance is particularly critical for women employees, who frequently manage multiple and overlapping roles in professional and domestic spheres (Brough and Biggs, 2020). Despite increased labor force participation, women continue to bear a disproportionate share of household and caregiving responsibilities, intensifying work–family conflict and stress (Medina-Garrido *et al.*, 2023). Studies show that women’s work–life balance is shaped by organizational policies, cultural norms, and gendered expectations, often resulting in greater role overload compared to men (Wani 2023; Tolera *et al.*, 2025).

In the higher education sector, work–life balance has gained increasing attention due to the complex nature of academic work, which includes teaching, research, publication pressures, administrative responsibilities, and career advancement requirements (Hasib *et al.*, 2022). Higher education institutions recognize that supporting work–life balance is essential for enhancing academic staff well-being, productivity, and institutional effectiveness (Dasaradhan and Kumaravel, 2024). However, inadequate work–life balance among academic staff has been linked to stress, burnout, job dissatisfaction, and reduced academic performance (Kalliath and Brough, 2022).

Female academicians face distinct challenges arising from the intersection of academic workload demands and persistent societal expectations regarding family and gender roles (Noronha and Aithal, 2020). Prior research indicates that women in academia experience significant conflict between professional obligations and family responsibilities, leading to emotional exhaustion and constrained career progression (Naz *et al.*, 2017). Even where supportive workplace policies exist, such as flexible schedules and parental leave, female academics continue to encounter work–life imbalance due to long working hours, inadequate managerial support, and unequal distribution of domestic labor (Goyal and Arora, 2012; Sharma and Mishra, 2023).

Despite extensive research on work–life balance, empirical studies focusing on female academic staff in developing countries remain limited. In particular, there is a paucity of evidence from Ethiopian higher education institutions, where contextual factors such as institutional support mechanisms, cultural expectations, and workload structures are likely to shape women’s work–life experiences. Addressing this gap, the present study examines the work–life balance of female academic staff at Ambo University, with specific attention to the challenges they face and the work- and family-related factors influencing their balance. By providing context-specific empirical evidence, this study contributes to the literature and offers insights for institutional policies aimed at improving the well-being and productivity of female academicians.

Materials and Methods

The study was conducted using a descriptive and exploratory research design. The exploratory design was used to gain an in-depth understanding of existing Work-life balance issues among female academicians, while the descriptive design allowed for a systematic description of the nature, extent, and characteristics of these challenges and the associated coping strategies.

The target population of this study consisted of all permanent female academic staff at Ambo University, ensuring that the study focused on individuals with sustained institutional experience. A census approach was adopted, involving all 131 permanent female academic staff members.

The study primarily relied on primary data, which were collected through structured questionnaires and focus group discussions (FGDs). The questionnaire was designed to capture detailed information on work- and family-related WLB challenges faced by female academic staff. Out of the 131 distributed questionnaires, only 120 were valid for data analysis. The questionnaire was evaluated through a pilot test conducted with a small group of female academic staff from similar institutions, ensuring that the items were clear, relevant, and understandable. In addition, FGDs were conducted with 12 female academic staff members from four campuses of Ambo University to gather qualitative insights. These discussions provided a richer understanding of participants' experiences and coping strategies related to work-life balance.

For data analysis, descriptive statistical techniques were applied to the quantitative data, and results were presented using tables. Qualitative data from the FGDs were analyzed thematically, enabling the identification of recurring patterns and key themes related to WLB challenges and coping mechanisms.

Results and Discussion

Demographic Background of the Respondents

This section presents the demographic information about the respondents who participated in the study. Table 1 shows the demographic background of the respondents. The study surveyed 120 female academic participants, predominantly aged between 22 and 30 years (50.8%) or 31-45 years (49.2%). A significant majority (91.6%) held master's degrees, while 90.2% were lecturers, indicating the predominant academic rank. The data also revealed insights regarding marital status, with 77.5% of respondents married, which is often associated with additional pressures related to work and family responsibilities. A considerable segment of the respondents (75.3%) also indicated they have children, suggesting implications for work-life conflicts. Demographic factors like age, education, academic rank, marital status, and work experience significantly impact women's work-life balance. Previous studies indicate that younger women often struggle with work-life balance due to career establishment and workload pressures, while older women face challenges related to caregiving responsibilities (Greenhaus and Powell, 2017). Higher education levels provide better job opportunities and flexibility, while lower education levels may face job instability and increased stress. Higher academic or professional ranks often face greater work demands, contributing to work-life conflict. Marital status also plays a crucial role, as married women, especially those with children, face difficulties in balancing professional and personal responsibilities (Singh and Chopra, 2019). Work experience also affects work-life balance, with more experienced women developing better coping strategies and stability, while less experienced women may struggle with time management and workload pressures (Kalliath and Brough, 2008)

Table 1. Demographic Information of the Respondents

Demographic	Specifications	Counts	Proportion (in %)
Marital Status	Married	93	77.50
	Unmarried	27	22.50
Age	22-30 years	61	50.80
	31-45 years	59	49.20
	Above 46	0	
Education level	First degree	7	5.80

	Masters	110	91.60
	PhD	3	2.50
Academic rank	Assistant professor	5	4.00
	Assistant lecture	7	5.80
	Lecturer	108	90.20
	Graduate assistant	0	0.00
Year of experiences	1-2years	9	7.50
	3-4years	14	11.50
	Above 5 years	97	80.80

Source: survey 2023

Work and Family-Related Work-Life Balance Challenges

This section explores the key findings related to how female academics navigate work-life balance, particularly in the context of family responsibilities, parenting, and the support system, presence of children, time spent on housework, prioritizing family responsibilities, concerns about work outside the academic, and spouse support.

Table 2 shows the parenting status of female academic staff. The analysis of the parenting and work-life balance landscape reveals significant insights into how family responsibilities and work-related obligations intersect for female academic staff. A majority of the surveyed individuals (75.3%) are parents. This indicates that parenting plays a significant role in shaping the work-life balance experiences of female academic staff. These results imply that work-life balance difficulties among female academic staff are not solely driven by workplace demands, but are also strongly influenced by caregiving responsibilities, including childcare, household management, and emotional labor. This indicates that professional roles are often intertwined with familial duties, creating a multitude of daily responsibilities that complicate the pursuit of work-life balance. Previous studies indicate that working mothers often contend with increased responsibilities at home, which can lead to feelings of being overwhelmed and underprepared in their professional roles. Dapiton *et al.* (2020) explained that many working mothers find they need to sacrifice personal time, professional development, or even career advancement

opportunities to manage childcare responsibilities.

The presence of children introduces numerous stressors that directly impact the work-life equilibrium for female academics. As established, working mothers frequently encounter heightened responsibilities at home, leading to feelings of being overwhelmed and impairing their professional readiness (Aga *et al.*, 2025). The rigorous demands of academia, including research, teaching, and institutional commitments, often lead to mothers reallocating personal time and professional growth opportunities to fulfill childcare obligations (Russo and Carmeli, 2015).

Table 2. Parenting and work-life balance

Presence of children	Frequency	Percentage
No	23	24.70
Yes	70	75.30
Total	93	100.00

Source: Survey, 2023

Household Chore Support and Time Spent on House Chores

The result presented in Table 3 shows that Household Chore Support and Time Spent on House Chores. The findings reveal a critical intersection between household chore support and the time female academics devote to domestic responsibilities. Although half of the respondents (50%) reported having support in managing household chores, a substantial majority (68.3%) still spent more than six hours per day on housework. This suggests that the presence of support does not necessarily translate into a significant reduction in

domestic workload, highlighting the persistence

The lack or insufficiency of effective household support intensifies work–life imbalance by increasing stress, fatigue, and burnout among female academics. Those without adequate support face compounded challenges as domestic demands consume time and energy that could otherwise be allocated to academic activities such as teaching preparation, research, publication, and administrative responsibilities. Even among those reporting support, the excessive time spent on house chores indicates that women continue to bear primary responsibility for domestic work.

These findings reinforce the argument that traditional gender role expectations continue to shape women’s experiences in academia. The expectation that women should simultaneously manage extensive household duties and

of unequal household labor distribution. demanding academic roles contributes to work–family conflict and emotional strain. This aligns with previous studies indicating that inadequate work–life balance support systems blur the boundaries between work and home, leading to spillover effects that complicate daily functioning (Medina-Garrido *et al.*, 2023).

Furthermore, the results are consistent with earlier research by Naz *et al.* (2017), which found that women disproportionately shoulder domestic responsibilities even while engaged in full-time professional employment. The convergence of these findings across different contexts confirms that unequal domestic labor remains a persistent and systemic challenge, significantly constraining women’s productivity, job satisfaction, and career advancement in academia.

Table 3. Household Chore Support and Time Spent on House Chores

Variable	Category	Frequency	Percentage
Support in Managing Household Chores	Yes	60	50.00
	No	60	50.00
Time Spent on House Chores (per day)	More than 6 hours	82	68.30
	3–5 hours	38	31.70
Total Respondents		120	100.00

Source: Survey, 2023

Family Support and Time Availability for Family

The findings presented in Table 4 reveal an important contrast between perceived family support and the actual time female academic staff are able to devote to their families. A substantial majority of respondents (77.5%) reported having understanding and supportive families, indicating that emotional and practical support is widely available. Such family understanding is crucial in alleviating domestic pressure and emotional stress, thereby facilitating improved work–life balance. Supportive families often contribute by sharing household responsibilities and offering encouragement, enabling female academicians to better cope with professional demands. This

finding aligns with Noronha and Aithal (2020), who reported that family understanding significantly reduces work–family conflict among women in academia.

Despite this high level of family support, the majority of respondents (66.6%) indicated that they do not have sufficient time for their family. This highlights a clear imbalance between professional responsibilities and family engagement. The inability to allocate adequate family time suggests that heavy workloads and institutional demands limit meaningful family interaction, even when supportive family structures exist. Such time constraints may lead to heightened stress, emotional exhaustion, and strained family relationships, ultimately affecting both personal well-being and professional productivity. Previous studies similarly note that insufficient

family time among working women is disengagement, and increased work–family associated with burnout, emotional conflict (Medina-Garrido *et al.*, 2023).

Table 4. Family Support and Time Availability for Family

Family-related factors	Response	Frequency	Percentage
Family understanding/support	Yes	93	77.50
	No	27	22.50
Sufficient time for family	Yes	40	33.40
	No	80	66.60
Total respondents		120	100.00

Source: Survey,2023

Prioritizing Family Life and Worrying About Work

The findings in Table 5 illustrate the complex interplay between family prioritization and psychological strain related to work among female academic staff. A substantial majority of respondents (75%) reported prioritizing family life, indicating a strong commitment to family responsibilities despite demanding professional roles. This reflects the reality that female academicians often navigate competing expectations between work and domestic responsibilities and frequently choose to give precedence to family life. Such prioritization is deeply influenced by social and cultural expectations placed on women, particularly in balancing caregiving and professional responsibilities. These findings are consistent with earlier studies by Naz *et al.* (2017), which report that women in academia often reorganize their professional commitments to accommodate family needs, sometimes at the expense of career advancement. Similarly,

Sharma and Mishra (2023) identified prioritizing family roles as a common coping strategy adopted by women to manage work–family conflict.

Despite this strong emphasis on family life, the results also reveal a high level of work-related psychological burden. Nearly half of the respondents reported that they often or always worry about work (49.2%), while only a small proportion (5%) indicated that they never worry about their professional responsibilities. This persistent concern about work beyond official working hours suggests blurred boundaries between professional and personal life. Continuous preoccupation with academic tasks, such as teaching responsibilities, research output expectations, and administrative duties, may significantly detract from personal and family time. As noted by Naz *et al.* (2017), the pressure to meet academic performance standards while fulfilling family roles can overwhelm female academic staff, leading to increased stress, anxiety, burnout, and a reduced sense of fulfillment in both domains.

Table 5. Prioritization of Family Life and Worry About Work

Variable	Response	Frequency	Percentage
Prioritizing family life	Yes	90	75.00
	No	30	25.00
Worry about work	Always	33	27.50
	Often	26	21.70
	Sometimes	55	45.80
	Never	6	5.00
Total respondents		120	100.00

Source: Survey, 2023

Spouse support for female academic staff

Table 6 shows female academic response on their spouse's support. Regarding analysis support majority of respondents explained the

limited support from their spouses in managing work and family responsibilities. Specifically, 46.3% indicated that they rarely receive spouse support, 35% reported receiving support sometimes, and 21% stated they never receive spouse support. This highlights that, for most female academic staff, spouse involvement in household or childcare responsibilities is minimal or inconsistent. Limited spouse support suggests that female academicians must shoulder a disproportionate share of domestic responsibilities, even in dual-income or professional households. The lack of consistent partner support likely exacerbates work–family conflict, increases role overload, and negatively impacts psychological well-being, job performance, and overall work–life balance. Naz *et al.* (2017) found that female academicians experience stress and fatigue when household and childcare duties are not shared equally. Similarly, Kim and Shin (2013) emphasized that spousal involvement is a critical determinant of women’s ability to maintain work–life balance.

Table 6. Analysis of Spouse Support

Spouse support	Frequency	Percentage
Never	20	21.00
Rarely	43	46.30
Sometimes	33	35.00
Total	93	100.00

Source: Survey, 2023

Challenges female academic staff are facing to balance work-life

Achieving a harmonious work-life balance is a multifaceted challenge shaped significantly by both personal and professional factors. The thematic analysis conducted in this study has shed light on the complexities that individuals, particularly women, face in managing their professional and personal responsibilities. Drawing on a survey that explored various dimensions of work-life balance, this article highlights the key personal factors affecting work-life balance, as well as the professional challenges faced by employees in today’s dynamic work environment.

Analysis of Personal related challenges: Work-Life Balance

The analysis was undertaken through an inductive thematic approach, refined following the methodology outlined by Braun and Clarke (2006). Transcribed data revealed various themes that emerged from participants’ experiences, with five primary themes highlighting the interconnected nature of personal circumstances and work-life balance.

Family Structure and Responsibilities: Family obligations, particularly those related to childcare, eldercare, and household chores, are predominant factors influencing work-life balance. The respondent explained that these responsibilities often extend their workday and create additional stress, making it challenging to balance their roles effectively. Supportive workplace policies that recognize these challenges can help alleviate the burden on employees (Allen *et al.*, 2020).

Location of Residence: The respondents expressed that there is a significant distance between their place of residence and their workplace, making commuting a challenge. The considerable distance between home and work may impact their work-life balance, reducing the time available for personal activities, family, or relaxation (Greenhaus and Allen, 2011). The respondents explained that the geographical location of the respondents affects work time.

Social and Cultural Expectations: Participants noted the significant impact of societal norms, which often place the expectations of caregiving and household management primarily on women, even if they hold full-time employment. They suggested that this cultural pressure can lead to a conflict between personal aspirations and professional ambitions, resulting in heightened stress levels for female academics. Prior research similarly demonstrates that traditional gender roles exacerbate work–family conflict and constrain women’s career progression in academia and other professional settings (Eagly and Wood, 2016; Naz *et al.*, 2017).

Parenting Issues: Balancing parenting duties specifically emerged as a central challenge for many respondents. The demands of parenting can interfere with work responsibilities and vice versa, highlighting the urgent need for workplaces to adopt more accommodating measures. They suggested that the institutions should prioritize understanding and supporting employee-parent needs to cultivate a healthier work environment. Consistent with earlier studies, the findings suggest that inadequate institutional support for parenting responsibilities contributes significantly to work–family conflict and burnout among female employees (Allen *et al.*, 2013; Noor, 2004).

Time Management Skills: Participants acknowledged difficulties in prioritizing tasks, adhering to deadlines, and allocating enough time for family life. They suggested that these challenges often lead to increased stress and burnout, emphasizing the importance of equipping employees with effective time management strategies.

Professional-Related Challenges of Work-Life Balance

The participants raised the concern that some non-desk jobs presented significant challenges. With irregular schedules, it's challenging to balance work and personal life. They explained that Long and Unpredictable Hours are spent studying at home, preparing for class, preparing teaching material, and conducting research at home. This added workload shapes the boundaries between professional and personal time, making it difficult to rest, engage in leisure activities, or spend quality time with family. Previous studies confirm that excessive workloads and the expectation of after-hours academic work significantly contribute to work–life imbalance, stress, and burnout among academics, especially women (Kinman and Jones, 2008; Winefield *et al.*, 2014).

Coping Strategies for Work-Life Balance Challenges

The study reveals that female academic staff utilize various coping strategies to achieve work-life balance, with time management being the most common approach (34%). Prioritizing tasks (27%) and seeking support from colleagues, supervisors, or family members (27%) also play crucial roles in managing professional and personal responsibilities. However, 12% of respondents reported not using any coping strategies, highlighting significant challenges in balancing their roles. The findings emphasize the need for institutional support, including professional development training on time management and prioritization, to enhance work-life balance among female academics. The previous studies also support this finding. For example, Jackson (2023) found that female faculty members experience greater service burdens and struggle with time management due to competing professional and personal demands. Similarly, Misra *et al.* (2012) emphasized that institutions should provide structured support, such as mentorship programs and workload redistribution, to help female academics manage their responsibilities more effectively.

Professional development training on time management and prioritization has been recommended in several studies as a way to empower female faculty members to navigate their roles more efficiently (Eaton *et al.*, 2020). Such training can improve their ability to balance research, teaching, and personal life, reducing stress and increasing job satisfaction.

The study highlights key organizational strategies that support work-life balance among female academic staff. Creating an appealing work environment (37.5%) emerged as the most effective approach, fostering collaboration, inclusivity, and employee well-being. Childcare facilities (33.3%) were also highly valued, easing the burden on working mothers and improving job satisfaction. While counseling services and flexible working hours were acknowledged by 5.8% of respondents each, they remain important tools for managing stress and promoting work-life integration. Additionally, 12.5% of respondents favored extended maternity leave, recognizing its role

in supporting new mothers and enhancing workforce retention. These findings underscore the need for institutions to implement supportive policies that promote a more balanced and equitable work environment. Prior studies indicate that access to on-campus childcare is a critical factor in supporting working mothers in academia. Wolf-Wendel and Ward (2016) highlight that affordable and accessible childcare facilities help female faculty manage their dual responsibilities, reducing stress and improving productivity. Similarly, Mason and Goulden (2002) found that the availability of childcare services directly influences career progression and job satisfaction for female academics.

In the focus group discussion, the participants also suggested that higher education should Reduce Teaching Loads compared to male academic staff. Temporary reduction of teaching duties after maternity leave is important. They argued that their teaching loads should be reduced compared to their male counterparts as a form of affirmative action, recognizing the additional family and household responsibilities that women often bear. By implementing temporary teaching load reductions, universities create a more inclusive, productive, and supportive environment for female academic staff. According to Misra *et al.* (2012), institutions with progressive maternity leave policies experience lower turnover rates among female faculty. Similarly, Cech and Blair-Loy (2019) argue that extended leave enables new mothers to transition smoothly back to work, reducing career interruptions and enhancing job satisfaction.

Conclusion

The study reveals the significant impact of work-life balance on female academic staff in higher education institutions. The majority of respondents are married women and mothers, indicating that family responsibilities significantly shape their experiences and challenges in balancing professional and personal life. Although most female academic staff report supportive family dynamics, a significant proportion experiences stress due to

dual expectations of work and home. This can hinder career advancement and contribute to feelings of inadequacy and dissatisfaction.

Female academics face various difficulties in personal, professional, and emotional spheres, including updating skills, improving careers, and maintaining professional networks. Manipulating both personal and professional obligations increases workload, causing emotional strain and discontent. Major obstacles to work-life balance include excessive household chores, a preference for family obligations over professional ones, worry about work when not at work, lack of support from superiors and subordinates, and personal and professional factors. Female academics employ coping mechanisms such as prioritization, time management, outsourcing, seeking support, and making personal sacrifices.

Recommendations

From a theoretical perspective, this study extends work-life balance theories by highlighting the gender-specific challenges faced by female academics, particularly the interaction between caregiving roles, workplace demands, and well-being. It emphasizes that work-life balance is a gendered and context-dependent process influenced by both organizational structures and social expectations.

From a managerial perspective, universities should implement flexible work arrangements, such as adjustable teaching schedules, reduced workloads for staff with caregiving responsibilities, and hybrid work options where feasible. Establishing on-campus or subsidized childcare services, along with access to counseling and mentoring programs, would help reduce stress and improve productivity among female academic staff.

At the policy level, governments should enforce labor laws, regulate academic workloads, and ensure equal pay and parental leave for female academics. Increased funding for higher education institutions to support childcare facilities, research grants, and gender

equity initiatives is also essential. Additionally, awareness programs that promote shared household responsibilities should be encouraged to reduce the domestic burden on women in academia.

Limitations and Future Research Directions

While this study offers valuable insights, it has certain limitations that future research should address. Firstly, it focuses only on female academic staff, excluding non-academic employees who may face different work-life balance challenges. Secondly, the study employs a descriptive research design, which limits the ability to establish causal relationships between variables. Lastly, the research is conducted only at Ambo University, making it difficult to generalize the findings to other institutions or sectors. Future studies can address these limitations by including both academic and non-academic female employees for a more comprehensive analysis. Additionally, using a mixed-methods or longitudinal research design could provide deeper insights into the factors influencing work-life balance. Expanding the study to multiple universities or organizations would also enhance the generalizability of the findings.

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Declaration of conflict of interest

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Teachers' Experience of Teaching and Caring for Children with Developmental Disabilities in Addis Ababa, Ethiopia

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Abstract

Developmental disability is a global issue, yet attention to it in Africa, particularly in Ethiopia, remains limited. In Ethiopia, educational and care institutions for children with developmental disabilities are scarce, largely due to societal misconceptions and insufficient support from the government and other stakeholders. While existing literature highlights challenges faced by teachers working with such children, little research has explored their experiences in the Ethiopian context. This study employed a qualitative case study design to examine the lived experiences of teachers teaching and caring for children with diverse developmental disabilities. Specifically, the study aimed to investigate teachers' understanding of developmental disabilities, their perceptions of teaching and caregiving, the strategies they employ, their lived experiences, and the approaches they use to overcome challenges. Data were collected through semi-structured interviews and analyzed thematically across these five dimensions. Findings revealed that, despite prevailing societal misconceptions, most teachers had a reasonable understanding of developmental disabilities and their causes. Although some were initially uninterested in working with these children, they gradually developed genuine passion and commitment. Teachers employed instructional and caregiving strategies such as modeling, imitation, role-playing, and visual aids. However, they faced multiple challenges, including unrealistic parental expectations, parental disengagement, lack of home-school collaboration, personal stress, societal stigma, slow progress among children, and marginalization by colleagues. To cope, teachers relied on spirituality, prayer, and emotional resilience, often disregarding negative societal perceptions. Despite their dedication, all participants considered leaving the profession due to persistent challenges and inadequate support. These findings underscore the urgent need for systemic interventions to improve teacher retention, enhance community awareness, and strengthen institutional support for educators working with children with developmental disabilities in Ethiopia.

Keywords: Developmental Disabilities, Experience, Teaching, Caring, Teacher

Introduction

Developmental disabilities are part and parcel of human life, and they could happen to anyone irrespective of race, culture, ethnicity, and place of living (Magaña *et al.*, 2016). Developmental disabilities are a group of

conditions due to impairment in physical, learning, language, or behavior areas, and these conditions begin during the developmental period, may impact day-to-day functioning, and usually last throughout a person's lifetime (Zablotsky *et al.*, 2019; Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) (APA, 2013). The disorders

typically manifest early in development, often before the child enters grade school, and are characterized by developmental deficits that produce impairments of personal, social, academic, or occupational functioning American Psychiatric Association (APA, 2013). The range of developmental deficits varies from very specific limitations of learning or control of executive functions to global impairments of social skills or intelligence. Developmental disabilities have been broadly construed as an umbrella term that includes other more discretely defined disability classifications sharing some common characteristics (Odom, Horner, Snell and Blacher, 2007). Developmental disability comprises intellectual disability, Attention-Deficit/ Hyperactivity Disorder (ADHD), Autistic Spectrum Disorders (ASD), Down Syndrome, Language Disorder, Learning Disability, and Fragile X Syndrome is some of them (Odom *et al.*, 2007). The developmental disorders frequently co-occur; for example, individuals with autism spectrum disorder often have intellectual disability (intellectual developmental disorder), and many children with attention-deficit/hyperactivity disorder (ADHD) also have a specific learning disorder (APA, 2013).

Children with severe and profound developmental disabilities have experienced different challenges in life. For example, according to (APA, 2013) children with severe and profound intellectual disabilities require support for all daily activities of living including, meals, dressing, bathing, and elimination. These children always require supervision, and the difficulty of spoken language and understanding of symbolic communication is very limited (Butcher *et al.*, 2014). According to Liu *et al.* (2025), Autism Spectrum Disorder (ASD) is characterized by persistent deficits in social communication and social interaction across multiple contexts, including deficits in social reciprocity, nonverbal communicative behaviors used for social interaction, and skills in developing, maintaining, and understanding relationships. In addition to the social communication deficits, the diagnosis of autism spectrum disorder requires the presence of restricted,

repetitive patterns of behavior, interests, or activities (APA, 2013).

Regarding the prevalence rate of developmental disability in African content, although developmental disorders are common among children all over the world, information on the extent and types of developmental disability in Africa in general and in Ethiopia, in particular, is extremely limited. For some countries, like Kenya, Mung'ala-Odera *et al.* (2006), reported the prevalence rate of 9.3% of neurological disability among children. In the Republic of South Africa, the prevalence of developmental disability among children was estimated to be between 5.2% to 6.4%. Durkin (2002) pointed out that though large numbers of children who live in developing countries are exposed to various forms of disability, not much is known about the prevalence and causes of developmental disabilities in these countries of the world. Durkin thought that some kinds of developmental disabilities seem to be more prevalent in these developing countries such as severe mental retardation.

In Ethiopia, it is estimated that nearly two million people have intellectual disabilities (WHO, 2004). Recent studies in Ethiopia report a broad range of child and adolescent mental health problems, with a pooled prevalence of about 24.7% in community samples (Mitiku, *et al.*, 2023), as high as 36.7% for emotional and behavioral disturbances in conflict-affected children (Tesfaw *et al.*, 2025).

Though it is very difficult to find the exact score of children locked behind closed doors, as some studies conducted in limited parts of Ethiopia assert that people living with different forms of disabilities in the country range from 1.9% to 3.5% of the total population, from which about 15.9% are children and adolescents below age 14 (Ashenafi *et al.*, 2001; Tirussew, 2005). Though the problem deserves the attention of all concerned bodies and facilitates the center in which children with developmental disabilities learn and are cared for, it is dire to find a center/school where children with different developmental disabilities would learn and receive care. This could be attributed to different factors,

including societal wrong perceptions about the problem and other related factors. In support of this notion, a study conducted by Tilahun *et al.* (2019) indicated that there is a severe shortage of services for children with developmental disabilities in Ethiopia. This study further indicated that access to services is also impeded by negative beliefs and stigmatizing attitudes toward affected children and their families. Due to the scarcity of care centers/schools for children with diverse developmental disabilities in the Ethiopian context, many children of the same disability are forced to lock themselves behind bars and are denied receiving the special care and intervention they deserve to receive in life.

With pertaining to Ethiopian societies' perceptions of developmental disabilities in children, a research survey conducted by the Ethiopian Ministry of Health (FMOH, 2012/13 & 2015/16) asserts that, like widely held perceptions among different African countries, the severe developmental disorder is more often attributed to supernatural causes, for example, spirit possession, bewitchment, or evil eye; a curse from God for perceived gross disobedience to God's commandments, ancestral violations of social norms (e.g., due to stealing), and denying rather than as a result of biomedical or psychosocial causes. In support of this notion, (Tirusew, 2005) asserts that children with mental retardation are perceived as 44 devils, Ganel Am, Likift am (possessed by an evil spirit), Dedab, Kilo, and Fuzo (cannot understand, stupid, or mentally ill). As a consequence, affected individuals and/or their families often seek help from religious and traditional healers rather than health facilities. Parents are often hesitant to involve their child with a disability in the immediate community, as they are seen to disgrace the family (Schiemer, 2017). Misconceptions and unfavorable attitudes towards disabilities and persons with disabilities result in continued stigmatization even in the few schools where students with different developmental disabilities are included. A large number of children with disabilities have been hidden at home and kept away from schools and other intervention programs (Tirrussew, 2005; Weldeab, 2006). As part of the society, the

attitude of teachers teaching and caring for children with diverse developmental disabilities will not be different from that of societal perception though teachers have an opportunity to revisit their attitude through the education they acquire through their academic endeavors. For example, Schiemer (2017), in his study conducted in Addis Ababa on teachers teaching children with diverse disabilities indicated that from the beginning of their job with children having different developmental disabilities, teachers have no welcoming attitude, and only through their stay in the job they develop an appetite for teaching and caring for children with disabilities.

In Ethiopia in general and in Addis Ababa in particular, the school/center where children with diverse developmental disorders attend their schooling and are cared for is hardly found. Accompanied by the scarcity of the center/school where children with developmental disabilities attend their schools and cared for, many children with such developmental disabilities are forced to spend their lives behind closed doors. Owing to the absence of government-owned schools that entertain the needs of children with a developmental disability in Ethiopia, the only few schools, for example, the school where the present study conducted in was established by the initiations of an individual where only some lucky children with the same problem and born to well-to-do families would get an opportunity to join the school such that each child is cared by one teacher which is too costly to cover the charge of schooling by the parents of the children with diverse developmental disabilities.

There are also different challenges associated with teaching and caring for children with different developmental disabilities. Teachers teaching children with intellectual disabilities have the following challenges, including burnout and stress, high turnover, shortage of teaching material, lack of teachers trained in special needs education, lack of enough classes, and poor learning environments, curriculum structure, acceptance in the society, motivation, poor salary, and expectations from parents. In the Ethiopian context accompanied by a

societal negative attitude towards the developmental disabilities, caregivers working with such children would experience different challenges including social exclusion, segregation, labeling them as disable like children they care for (Belaynesh *et al.*, 2018; Schiemer, 2017).

The present study focuses on teachers teaching in Young Root English School, Addis Ababa. In this school, some teachers are caring for and teaching children with diverse developmental disabilities. In aggregate, there are about 701 students who are attending their education in the regular program in this school. Of 701 students, 51 of them are medically diagnosed with different developmental disorders. That means, out of the total children currently attending their education in this school, 7.27% of children are medically diagnosed with diverse developmental disorders. Of 51 children with diverse developmental disabilities, 8 (1.14%) of them were categorized under severe and profound types of developmental disabilities, where they are under the close attention of one teacher for one child. In this case, the teachers' role is more about caring and teaching basic life skills, including toilet training, meals, dressing, bathing, and elimination, certainly focusing on adaptive functioning skills. Though different challenges could be associated with such types of caring, no research has been targeted to examine the situation of teachers teaching and caring in the mentioned school.

Understanding the challenges teachers encounter in teaching and caring for children with developmental disabilities is a crucial first step toward enhancing the support they receive, ensuring that these children obtain appropriate care and education in schools. The scarcity of research on this topic in Ethiopia underscores the significance of this study in contributing to a deeper understanding of the difficulties teachers face in this context. Furthermore, there exists a substantial gap in knowledge and attitudes regarding developmental disabilities within Ethiopian society. Therefore, this study aims to explore the lived experiences of teachers working with children with diverse developmental disabilities and to identify the

copied strategies they employ to manage the challenges encountered in their work.

Consequently, the following specific objectives are forwarded to be addressed:

1. To pinpoint teachers understanding of developmental disabilities
2. To examine teachers' perception of teaching and caring for children with developmental disabilities
3. To examine the approaches employed by the teachers to teach and care for children with developmental disabilities
4. To investigate teachers' experiences while teaching and caring for children with developmental disabilities
5. To scrutinize the strategies teachers use to overcome the challenges of teaching and caring for children with developmental disabilities.

Materials and Methods

Design

To attain the research objective, a qualitative research approach accompanied by a case study research design was employed to address the phenomenon.

Description of the Study Area

This study was conducted at Young Roots English School, a private institution located in Yeka Sub-City, Addis Ababa. Established in 2008, the school offers education from kindergarten to grade eight and currently serves approximately 701 students in its regular program, supported by about 120 teachers. Inclusive education was introduced in 2012 through the initiative of one of the school's teachers.

Like most private and government schools in Ethiopia, Young Roots English School provides standard academic services to its students. However, it distinguishes itself by extending educational opportunities to children with severe and profound developmental disabilities. Each of these children is assigned a dedicated teacher, whose salary is covered by

the child's parents. Currently, the school accommodates 51 children with various developmental disabilities, of whom eight are classified as having severe or profound disabilities.

A unique feature of the school's instructional approach is the one-teacher-per-child model used for students with severe and profound developmental disabilities. To facilitate this, one large classroom is subdivided into four smaller sections, with each partitioned space dedicated to individualized teaching and care. This arrangement allows teachers to provide close, personalized attention to each child, ensuring both educational and developmental support.

Study Respondents and their Selection

In 2021, out of six teachers engaged in teaching and caring for children with severe developmental disabilities, three who were willing to participate were selected for this study, along with the school director. The school director was included to provide comprehensive information about the school's background and operations. He is in his early forties and has served as the school principal for the past six years. Data collection continued until information from participants became repetitive and no new insights emerged, indicating that data saturation had been reached. The background information of the participating teachers is summarized as follows:

Case 1 is a 30-year-old male with a bachelor's degree in Psychology. He has been working at the school for nine years and currently serves as the head of the Special Needs Education Program, in addition to teaching and caring for children with developmental disabilities. Case 2 is a 24-year-old female who earned her bachelor's degree in psychology in 2015. She has been teaching at the school for four years and has consistently worked with children with various developmental disabilities since her recruitment. Case 3 is a 22-year-old female who graduated with a degree in Special Needs Education in 2018. Since graduation, she has

been employed at the same school, working with children with diverse developmental disabilities.

Instrument of Data Collection

To collect data, a semi-structured interview guide developed by the researchers based on a comprehensive review literature was employed. The research questions were categorized into five major parts. The first part was on the knowledge of teachers about developmental disability with two semi-structured interview guide questions. These were "As a teacher of children with a developmental disability, would you please share with us your understanding of what a developmental disability is? Do you think it is possible to improve the situation of children with developmental disabilities?" The second part was on teachers' perceptions of teaching and caring for children with developmental disabilities with one semi-structured interview guide question. The question was, "What do you feel about teaching and caring for children with developmental disabilities?" While the third one was on approaches employed by the teachers to help children with developmental disabilities, one semi-structured question was put to the informants, and the question was "Would you tell us your style of teaching and caring for children with developmental disabilities?" The fourth was on teachers' lived experiences caring for and teaching children with developmental disabilities with one question. The question was, "Would you please share with us your lived experiences caring for and teaching children with developmental disabilities?" The fifth was on coping strategies teachers use to overcome the challenges they face while teaching and caring for children with developmental disabilities with, one question: "What type of techniques do you use to cope with the challenges you face while teaching and caring for children with developmental disabilities?" The content and construct validity of the instrument were checked before using it for the final data collection through consultation with area expertise.

Procedures

A few days before the interview started, permission to conduct the study was achieved from the school principal. After participants' permission to participate in the study was obtained, they were informed ahead that they will have an interview one week before the interview session, and the interview was conducted at the participant's convenient time. All the interviews were conducted in the natural settings of the informants, specifically in their offices, which were comfortable. The interview was made in the language preference of the participants to make the communication smoother and more natural. In the meantime, unstructured follow-up questions were asked to solicit further elaboration of the topic or to check the meaning that interviewees associated with keywords that they used. According to Åkerlind (2005), these questions commonly took the form of 'Would you tell me a bit more about that?', 'Could you explain that further?', 'What do you mean by that, please?', 'Could you give me an example?' The timespan of all interviews was between the ranges of 30 minutes to 1 hour. All the interviews were recorded. Additionally, notes were also taken by hand to augment the recorded data. Then, after the session was over, the data were transcribed. And then, it was translated back into English with maximum accuracy. Then, the data were sorted and sifted theme by theme for the next stage of analysis.

Analysis

The collected interview data were transcribed, coded, and organized according to the research questions, with participants identified by pseudonyms and interview numbers. Most interviews were transcribed promptly to ensure accuracy. The researchers, who also conducted the interviews, handled transcription and translation to preserve participants' expressions and emotions and confirmed accuracy with the participants.

The researchers repeatedly reviewed the transcripts to identify and highlight concepts, phrases, ideas, and patterns, which were then grouped into meaning units and clustered into

themes based on conceptual relevance. From these themes, descriptive narratives were developed to capture participants' experiences and challenges, providing rich, nuanced insights into their lived realities.

Using these textural descriptions, the researchers further constructed a structural understanding of participants' attitudes, knowledge, experiences, and coping strategies in caring for children with developmental disabilities. Finally, textural and structural descriptions were synthesized into composite narratives that captured the essence of participants' experiences, enabling a holistic understanding and informing the study's conclusions.

Research ethics

The data were collected after the consent of the respondent was achieved. Not to expose the identities of the participants, numbers from 1 to 3 were given for the teachers who participated in the study. The numbers were simply nominal, and they would not show any ranking. In doing so, confidentiality and anonymity have been secured. Confidentiality of the data collected from the participants was assured and guaranteed, and the results will be used for academic purposes and nothing more.

Results and Discussion

School Profile and Screening Criteria for Children with Developmental Disabilities

Case 1 is, fortunately, the initiator of inclusive education in the school. Before his recruitment to the school, the school had only been established to teach regular/typical children. Following his recruitment to the school, since he has a keen interest in helping children with developmental disabilities, he had a discussion with the owner of the school on how to launch a special needs education program within the school, for which he got the green light to do so and launched a special needs education program in the school in 2012. Indeed, before he joined this school, he had been serving at

Nehemiah (the private institution launched to care for and teach children with Autistic Spectrum Syndrome). The case urged that the experience he has accumulated from the mentioned institution helps him to launch the program in the present school. The case stated that “*Serving at the Nehemiah institution provides me with an opportunity to get much training, particularly on how to teach and care for children with diverse developmental disabilities.*”

For the question “What initiated you to love to work with children with different developmental disorders?” The Case stated that his interest to work with children with the developmental disorder is associated with his personal life where he emotionally stated that,

“When I was a kid, I lost my beloved father to a psychotic disorder where my father was diagnosed with mental illness and forced to spend behind the closed doors without getting any medical attention or psychological services. By that time, though I was a kid, the situation of my father is still fresh in my mind. Finally, I lost my beloved father to this deadly mental illness and since then, as much as the situation allows me, I promised myself to help any person with such and the like disorders. I believe that, if my father had given better treatment/psychological services, I couldn't have lost my beloved father at his early age. This is why I determined to help an individual with developmental disabilities.”

Therefore, it is possible to deduce that the special needs education program was launched in the school based on the initiation of an individual teacher who had a painful personal experience in his own family. This is also true for other institutions working on children with diverse developmental disabilities in Ethiopia, such as the *Nehemiah* and *Joy* center, where the initiators of the institutions associate the commencements of the mentioned institutions with their personal family experiences. In Ethiopia, there are no government-led institutions working on children with diverse developmental disabilities; the existing institutions working on the same children were

established by personal initiatives of individuals.

As the case is also one of the initiators who brought the idea of partitioning the rooms wherein children with severe and profound developmental disabilities are cared for, for the question, “Where did you get the idea of teaching and caring for children with developmental disabilities in one partitioned room by one teacher?” The case reported that,

“I initiated one-to-one teaching and care for children with severe and profound developmental disabilities with two assumptions. Firstly, in the modern education philosophy, leave alone for such children with severe developmental disabilities; the so-called normal children are, if possible, suggested to be learned by one teacher each. And the second assumption is that, before the present partition was introduced, children with different developmental disabilities with similar levels of disorder were learned together, but the result was not productive. Because they copied and imitated bad behaviors from each other's and gravitate to one another to disturb the classes. Therefore, to avoid the problem, partitioning the room and assigning one teacher for one child with a severe developmental disability was introduced.”

For the question “Have you checked the advantage and disadvantages of teaching and caring for children with a developmental disability with one teacher in a partitioned room?” The case replied that,

“Since the introduction of the one-to-one teaching and care approach, significant positive changes have been observed among children with developmental disabilities. This method allows teachers to dedicate their full attention to each child, making it easier to monitor progress and address individual needs. Many children enter the school with serious challenges such as difficulties with toilet training or self-feeding making it extremely demanding for a single teacher to handle more than one child. The one-to-one approach has helped overcome these challenges and improved children's development. However, the

system also presents financial constraints. Previously, when several children with similar conditions were grouped together, parents paid minimal fees. Under the one-to-one model, parents are responsible for both the school fees and the teacher's salary, creating financial strain for some families. As a result, a few parents have been unable to continue sending their children to school. To ease this burden, the school now allows one teacher to work with two children when their conditions permit, ensuring continued support while reducing costs for parents."

A review of the literature failed to reveal unilateral evidence that establishes the superiority of one educational arrangement over another on academic or social criteria for children with developmental disabilities. Recent evidence on educational placements for students with learning, emotional, and behavioral disabilities suggests that the clear academic or psychosocial superiority of special classes over inclusive or regular classroom settings is not supported in modern research. For example, a recent meta-analysis found inconsistent effects of inclusive versus segregated placements on learning and psychosocial outcomes for students with special needs, with no consistent advantage for special class placement (De Boer *et al.*, 2014). Large-scale data indicate that inclusive schooling does not detrimentally affect peer outcomes and may offer benefits in academic performance when supports are embedded (Kocaj, 2025). Additionally, students with specific learning disabilities continue to show differences in social-emotional-behavioral skill profiles linked to educational contexts, emphasizing the nuanced nature of placement effects (Feraco *et al.*, 2024). Such cases provide evidence that shows integration should be based on individual needs. Teachers also face constant dilemmas while teaching and caring for children with diverse developmental disabilities (Dyson, 2001). The dilemma includes pace, learning styles, seating arrangements, and individual attention. Catering to a range of needs in a single class was difficult for some teachers.

Therefore, it is possible to infer that both segregation and inclusion of children with developmental disabilities with other typical children should be based on individual needs where environment shall be designed to ensure maximum interaction between children with severe disabilities and their chronological age peers, and at a level that should also occur in the wider community.

For the question "What type of screening criteria your school is being employed to place children to different levels and types of developmental disabilities?" The case reported that,

"The parent of the child should present the diagnosis and assessment made by medical doctors. However, the problem associated with the claimed diagnosis and assessment made by medical doctors is that it is most of the time found to be challenged. For example, in many cases, where children fail to utter a single word since they were born, the so-called made assessment by medical doctors indicates Mild Autistic Spectrum Disorder (ASD) or Mild intellectual disability. I think, they negligently do so or have an interior motive to do so. Owing to this problem, as much as our knowledge allows us to do so, we have been doing our best to employ DMS-V and other screening instruments in our school for the classification. Hence, honestly speaking, it is difficult to say that we are employing strict assessment criteria to place children with developmental disorders to different levels and types of developmental disorders. We only allocate those who are with severe and profound developmental disorders (not yet utter words, total dependence on the other for basic support including meals, dressing, toilet elimination, and etc.) in the special room especially centering on the direction given in the DSM-5 for classification."

Unfortunately, many children with disabilities in developing countries, particularly those with "mild to moderate "disabilities, are not identified until they reach school age (WHO, 2004). In Ethiopia, accompanied by different factors, the culture of assessing and diagnosing children with different developmental

disabilities is almost nonexistent. Leave alone assessment and diagnosis, recognizing these developmental disabilities as a problem in this country is in its infancy stage. Owing to this factor, the habit of exercising assessment and diagnosis in children with a diverse developmental disabilities is yet acculturated to our context even among the professionals of this area and other concerned bodies perhaps medical doctors. Therefore, it is not striking if the present school has no rigid rules to follow for assessment and diagnosis in the school for the screening purpose.

For the question “Would you tell us how teachers teaching and caring for children with developmental disabilities recruited in your school?”

The Case stated that:

“Though we give priority for professionalism especially for special need education and psychology graduates, interest is better than areas of specialization. For example, simply being graduates of special needs education and psychology won't bestow you with the patience and gut to help children with developmental disabilities. Therefore, interest is very important for helping and caring for children with developmental disorders. For example, to share you what I have experienced in my life, one of a friend of mine was graduated in psychology with me and we got an opportunity to work with children with developmental disorders in one institution. It is obvious that working with children with DD requires to provide all services including toilet training, bathing the child, in some cases washing their underclothes (lingerie) as they may extricate in their clothes and the, etc., the friend of mine who graduated in psychology was not able to stay in the institution and quit the job shortly. Indeed, doing these need great patient and commitment. Thus, graduating in special needs education or psychology is not a guarantee for the success of teachers teaching and caring for children with developmental disabilities rather interest and willingness to shoulder all the mentioned challenges are very important for helping children with developmental disabilities. Therefore, only professionals (psychology and special need education)

graduates who have a gut and commitment to help children with developmental disabilities are employed to serve in our school.”

From the informant's response, it is possible to deduce that professionalism plus willingness to support children with developmental disabilities is the best criteria for teaching and caring for children with developmental disabilities. Indeed, unless a person has a gut and commitment to help children with such disorders, only graduating from a psychology or special needs education program or other related professions won't bestow individuals with the courage and commitment to help such children.

Knowledge of developmental disabilities

As indicated in the review literature, developmental disabilities are not caused by a curse, God's presence, evil spirits, or other societal hearsay; rather, almost all developmental disorders are caused by genetic, environmental, and epigenetic factors (APA, 2013). In other words, the teachers in our case are expected to have a comprehensive understanding of developmental disability and its causes to provide effective care and services for the children who are in need. When it comes to the respondents of this study, the three informants were found to know that, against the widely held wrong perception that developmental disability is caused by a curse, God's presence, evil spirits, and other factors, the three informants responded that developmental disabilities are not instigated by a curse, God's presence and the like; rather biological and genetic factors cause the disorders. This was confirmed after the cases were asked the question, “What is your understanding about developmental disabilities?”

In this regard the responses of the respondents are presented as follows: For example, Case 1 stated that:

“As you know, our society perceived this disorder as caused by a curse, possession by evil spirits, and the like. But the reality is different from that, and developmental

disabilities are not caused by a curse, evil spirits, etc. rather something that happens to any humankind. So, it is more of biological factors rather than the wrong widely held view of our society where most of our society attributes these developmental disorders to different factors, including a curse, possessed by evil spirits, to mention a few."

The remaining two cases also supported this view. Indeed, in the Ethiopian traditional society, a developmental disability is perceived as negative; however, with the expansion of modern education and the influences made by Ethiopian scholars and other celebrities, the societal wrong perception of developmental disabilities is being challenged. In tune with the Case 1 view, the remaining two cases presented their notion as follows:

Case 2 stated that:

"As you know, our society associates children's developmental disorders with a curse, God's presence, possessed by evil spirits and the like. As part of the community, before I get to understand the possible causes of the developmental disorders through education and the training I got in this area, I had been associating such disabilities with a curse and the like. Once I get learned, I came to notice that developmental disabilities are not caused by a curse or the work of evil spirits rather it caused by biological and genetic factors."

Case 3 further reinforces case 2's notion that:

"As you know developmental disabilities include different kind of disorders. The society also gives different names to the disorder and associates such disabilities with evil spirits, curses, and the like. However, in reality, these disabilities are caused by biological factors than what the society associated with it."

From the three informants' responses, it is possible to deduce that, against the wrong widely held idea that developmental disabilities are associated with an evil spirit, God's presence, and a curse and what's more, the teachers teaching and caring for the children with developmental disabilities at the present school have a reasonable understanding about the possible causes of developmental

disabilities, where they stated that developmental disabilities are caused by genetic, environmental, and epigenetic factors (Parette and Peterson-Karlan, 2008). Having a better piece of knowledge about the possible causes of this disorder is very essential; because, had the teachers of the school had wrong perceptions about the root causes of this disorder, it could have difficult to make a change in children with developmental disabilities in the school. Hence, it is possible to conclude that the teachers have a better understanding of the possible causes of developmental disabilities in children, which is truly essential for facilitating intervention and providing support for the children who are in need.

The cases were also asked whether it is possible to improve the situation of children with developmental disabilities or not? For the question, all cases were unanimously reflected their thought that though it is very difficult to reverse the situation, it is possible to improve the condition of children with developmental disabilities.

For example, Case 1 stated that,

"Yes, it is possible to bring about a change in children with developmental disabilities. For example, in this school, there is one child who was admitted to our school at the age of six. When he joined our school, he was not able to produce a single word, but with the efforts made by our teachers and caretakers, the child started to construct words and speak after two years when he became eight years old. This indicates how it is possible to bring about a change in children with severe developmental disabilities. So, even if the problems of developmental disorders are not reversible, it is possible to improve the situation."

Case 2 and 3 further reinforced what case 1 stated in above.

Case 2 stated that:

"Yes, it is possible. Though it is tiresome to work with such kinds of children and need to wait for months and sometimes years, it is possible to bring about a change in such children. For example, there was one child

which was admitted to our school, he had a speech impairment and couldn't not utter a word in addition to this he had a problem performing basic life skills like toilet training and feeding himself independently, etc. However, after he had spent eight months with me, he begins to construct words and other developmental changes witnessed on him."

Case 3 added that:

"Though it takes time, it is possible to bring about a change in such children. For example, while I'm serving in this school, many children had shown improvement and allowed to attend inclusive classes. Therefore, I dare to say that it is possible to bring about a change in such children even if it is tiresome."

From the three Cases' response, through a hard work and serious follow-up and effort there is a possibility to bring a change with children with developmental disabilities. Indeed, in reality, though it is demanding, it is possible to bring about a change in children with developmental disabilities. It is an encouraging finding that the cases were found to have a healthy outlook about children with developmental disabilities. This outlook would have helped them so far and would help them in the future for their endeavor to help children with the disorder. Having such a positive outlook is very essential because, unless the teachers are confident enough to bring a change in children with such disorders, it is dire to bring a desirable change in children who are in need. In support of the present notion, Christie (2013) stated that though it is difficult to reverse the condition of children with developmental disabilities, it is still possible to bring about a desirable change in children with the same disorders. As to Christie, intervention is more effective if it involves families of children with developmental disabilities.

Attitude towards Teaching and Caring for Children with Developmental Disabilities

In the beginning, the widely held wrong perception in the Ethiopian traditional society about children with developmental disabilities clearly placed its influence on the teachers teaching in the present school. However,

through time, all teachers who participated in the present study began to love teaching and caring for children with developmental disabilities. In contrast to their response, all cases wish to leave the job for another in the future. Their attitude was learned when the question "What do you feel about teaching and caring for children with developmental disabilities?" Case 1 responded that:

"Truly speaking, my priority in this school is serving children with different developmental disabilities, and making money is my second priority. I help a child with developmental disabilities with passion and if you ask me which children I prefer to work with among children with developmental disabilities and the so-called normal children, my choice is clear and I prefer to work with children with developmental disabilities over the normal children. I love this work with passion. But the saddest thing is that, I don't want to continue with this work; because, in the near future, I want to move on with my life. For the question what do you mean by that? The case stated that though I want to contribute more to this school, it is difficult to lead my life while working with these children because what I experience at school with such children always remained with me and I found it difficult to continue in such a manner. Working with these children affected my daily life in a sense that sometimes when you are dealing with these children you may be forced to raise or lower your voice/pitch in the process of help depending on the child's case. I, unknowingly use high pitch/voice when speaking to my friends which they try to tell me to lower my voice incessantly. Therefore, shortly, I will leave this school and possibly change my work only to go on with my life peacefully."

Equally terrifying is the fact that though the case has joined the job with passion and purpose, he no longer wishes to continue in the job urging that the situation of children he teaches and cares for interferes with his personal life. From the case's description, it is possible to learn that, though he loves to help children with developmental disorders, the challenges associated with helping children of such problems push him to quit this job and prefer to look for another job.

Case 2 and 3 further reinforce case 1's notion that;

Case 2 stated that:

"To be honest with you, upon I joined and began working with children having developmental disabilities I got confused and got frustrated. The reality is that, as you know, there is a wrong perception in the society; and besides, it is also dire to teach and care for such children and demands serious patience to help such like children. Nonetheless, bit by bit, I get to adjust myself to the situation and love to help such children. Especially, when I began to notice some changes in the child, I began to love my work. The case added that" if I get another job, I leave for the new. The reason is that teaching and caring for children with developmental disabilities is so tiresome."

The thought of Case 2 also supported by Case 3 which the Case stated that:

"Honestly speaking, in the beginning, it was very tough for me to make myself ready for the service. I get confused because what I learned in college theoretically and what I have experienced in real practice is so different. The task was new, I was new, and things were complicated in the beginning. However, bit by bit, I was able to make myself ready for the job and currently I'm happy with my work. But because the job is so demanding, if I get another job I would leave the present job for another"

As it is easy to discern from the response made by the three cases, except case 1 where he joined the job with passion from his recruitment to the school, the other cases (Case 2 and 3) didn't have a positive attitude towards the work at the onset of their assignment to work with children having developmental disorders. However, through their stay in the work, they have developed an appetite to help children with different developmental disabilities. However, the bad news is that in all cases, the Informants are wished to leave the job for another, not because they hate the job rather the challenges associated with the job including stress, interfere in one's life, forced to wait months, and in some cases years even to see a single change in children with

developmental disabilities, not to mention societal wrong perception towards the work.

Approaches employed by the teachers to help children with developmental disabilities

Informants have employed different approaches in their teaching and caring for children with developmental disabilities. In all cases, planning is compulsory. Each teacher needs to have a plan ahead, especially what types of behavioral changes the child is expected to exhibit within the given time. Most of the time the changing emphasis on adaptive functioning as children with severe and profound developmental disabilities are dire to execute basic daily functions. Teachers use different approaches to teaching and caring, including modeling, imitation, reinforcement, using pictures, role playing, repeating the action the teachers want the child to learn tirelessly. This was learned by asking the question, "Would you tell us your style of teaching and caring for children with developmental disabilities?"

Case 1 reported that:

"I always make a plan before the intervention. After looking into the situation of the child with a developmental disability, I usually plan what to do with the child and what type of behavioral changes should be exhibited by the child first, and what should be followed in such a way that behavioral changes in the child examined. I use different methods while teaching and caring for children with developmental disabilities including role-playing, classical conditioning, picture, and imitation. This is why one to one approach is very effective in teaching and caring for children with developmental disabilities."

Both informants 2 and 3 see eye to eye with what case 1 reported.

For example, case 3 stated that:

"Before any intervention, having a plan is compulsory in this school and the coordinator also checks whether we have a plan for what we are going to do. Importantly, without planning, it is very difficult to bring about a change in children with such disabilities and sometimes you feel confused if you don't have a

plan for what you are going to do. In our case, since the child comes to us with different challenges, we need to identify and prioritize on which behavior we have to work. Most of the time, I use pictures, imitation, modeling, role-playing, and the like to teach the assigned child."

From the informants' responses, it is possible to infer that they have been employing different approaches in teaching and caring for children with different developmental disabilities including, imitation, modeling, role-playing, to mention a few. In support of these findings, Davis and Rehfeldt (2007) stated that for intervention with children who acquire intellectual and developmental disorders, modeling, reinforcement, imitation, using gestures, verbal instruction and physical prompts are suggested. In line with the present findings, Browder *et al.* (2014) suggested different strategies to teach and care for children with severe and profound developmental disabilities including prompting, simultaneous prompting, least intrusive prompts which is another prompting alternative with a strong evidence base is the system of least intrusive prompts an instructional strategy that delivers prompts only as needed to teach discrete or chained tasks. In a system of least prompts, the instructor may begin with a verbal direction, followed by a model and then physical guidance, only providing as many of these prompts as the student needs to produce the response. Most-to-least intrusive prompts are also another strategy where sometimes the safety or motoric demands of a task suggest the need to begin with a more intrusive prompt such as physical guidance. A strong body of evidence supports the use of most-to-least prompting to teach vocational and daily living skills, such as cooking and sewing (Aykut, 2012). Instructors initially used physical guidance in training and then faded physical prompts over time. Another strategy is reinforcement. Whatever prompting is used, instructional planning must also include plans for reinforcing correct responses. Besides, teachers must decide on a schedule of reinforcement for teaching a skill. Initially, teachers should reinforce every correct response with descriptive praise, like, "Good

job saying m!" (Cooper *et al.*, 2007). Eventually, all forms of reinforcement should be faded so the student can consistently perform the skill without attention from the teacher.

Lived experiences for caring and teaching children with developmental disabilities

Though participants feel proud of helping children with developmental disabilities, most of the time they associate many challenges including parental give up and parental high expectation simply because they pay salary for teachers, personal stress while teaching and caring for such children, the elongated time frame to see a single change on children with developmental disabilities are part of the challenges. This was obtained by asking the question "What are your lived experiences for caring and teaching these children with developmental disabilities?"

For the question, Case 1 reported that:

"I associate helping children with a developmental disability with spirituality. While I'm serving these children and see changes, it gives me serenity. I feel as if I'm saving lives and proud of myself for doing that. Though helping somebody who is in need gives me satisfaction. There are many challenges while teaching/caring for children with diverse developmental disabilities. To mention few; societal negative attitude, parental losing hope since it takes longer duration to see changes in their children. It is obvious that, as a human being we would like to see the fruits of our efforts immediately, but when it takes elongated time, it frustrates you and sometimes pushes you to experience stress. Moreover, providing support to such kind of children also interferes with your personal lives. Because, if you are working with such kind of children, you can't avoid thinking about them which inadvertently or deliberately interferes in once life."

Case 3 has also reported a similar lived experience as follows:

"Indeed, helping someone in need gives you satisfaction, especially when you see progress in that child, it motivates you to work more."

However, besides the challenges of teaching and caring for such kind of children, societal attitude towards children with such disorder is most challenging. For example, the society label them and say different things about them, as a result a person who is working with them would be affected. In addition, you will be forced to wait for months and years to see changes in those children which leaves you with stress and frustration. The other problem we are facing in this school is even though we shouldered a huge burden we are not treated equally with other teachers who are teaching the so-called normal children, and they belittle us."

Case 2 on her parts stated that:

"I have learned a lot from caring and teaching children with developmental disabilities. Though it is challenging to teach and care for such children, I get spiritual satisfaction from the service I provide. Sometimes, what makes this job very frustrating is that, there is no continuity of support from home, when they go and mix with the family, they will forget what they learned and I will be forced to repeat the same thing again and again."

As it is easy to understand from the respondents' description of their lived experience with children having developmental disabilities, many challenges are associated with this work, including extreme parental expectation, loss of hope on the part of children's parents, lack of a professional link between school and home, personal stress, societal negative attitudes towards the work, interference in one's life, disparaged by other teachers teaching the so-called normal children, and waiting for a long time to see a change on children are some of them. In support of the present findings, limited access to specialized training, inadequate instructional materials, and large class sizes weaken teachers' capacity to support diverse learners (Burningham *et al.*, 2024).

Coping strategies

Teachers of the present study have employed different strategies to deal with the challenges they face while teaching and caring for children

with developmental disabilities, including associating the support they provide for such children with spirituality, using the power of prayer, receiving the support of their families, giving a deaf ear to the societal wrong perception about children with developmental disabilities, to mention a few. This answer was obtained by asking the question, "What types of technique you have been employed to cope with the challenges you face while teaching and caring for children with developmental disabilities?"

Case 1 reported that:

"I associate serving children with such disorder with spirituality and helping such kind of children gives me serenity. But I have a plan to leave this job and want to move on with my life. I also believe in the power of prayer."

To further reinforce Case 1's notion, case 2 reported that:

"To get relief from the stress I acquire while caring for and teaching children with a developmental disability, I pray to God and get serenity."

In support of both Cases, case 3 stated that:

"For the societal hearsay, I always chose to lend them a deaf ear and move on working my business and the good news is that my parents are supportive, and they encourage me to stick to my work. And I also believe in the power of prayer to cope up with the challenges."

In all cases, the informants were related to helping children with a developmental disability with spirituality. Many Ethiopians give much value to spirituality. As being religious encourages benevolence, though teaching and caring for children with a developmental disability is perplexing, participants prefer to link their work with children having a developmental disability with spirituality, which is appreciated in all religions in Ethiopia be it, Christian or Islam.

Conclusion

Contrary to the widespread misconceptions in society about children with developmental

disabilities, the teacher participants demonstrated a sound understanding of the nature and possible causes of developmental disabilities. All informants unanimously expressed confidence that, although it may be difficult to fully reverse such conditions, meaningful improvements and positive changes in the children's development are indeed possible. From the first day of joining the present school, except one informant who has joined the school with a passion to help children with developmental disabilities, the rest informants had not welcomed the job with passion during their first experience of the school. However, through time, they have developed an appetite to help children with such disorders with passion. Teachers at the school have employed different approaches to teach and care for children with developmental disabilities including modeling, imitation, role-playing, and the like. While teaching and caring for children with different developmental disabilities, informants of the study have experienced different challenges including excessive parental expectation, lack of parental engagement, lack of a professional link between school and home, personal stress, societal negative attitude towards the work, interference in one's life, disparaged by other teachers teaching the so-called normal children, waiting for a long time to see a single change in children, to mention a few. Informants have been employed different coping strategies including associating their work with spirituality which is also favored by almighty God and appreciated by their respective religious teaching. Informants also use the power of prayer, ignoring the societal hearsay about developmental disabilities. Citing the challenges associated with teaching and caring for children with developmental disabilities, unfortunately, all informants are planning to leave the job for another. Indeed, caring for and teaching children with developmental disabilities is very demanding, and it is not striking if informants develop an appetite to leave the job for another; therefore, great homework is waiting for the school, especially on how to retain the teachers on this job maybe through budgeting an attractive salary for the teachers and introducing different entertainment activities to retain the teachers in

the school to minimize the number of teacher turnover.

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Declaration of conflict of interest

This research did not receive any financial support from funding agencies or institutions. The authors also declare that there are no conflicts of interest related to this study.

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The Quality of Cleft Care Services at a Tertiary Cleft Care Center in Addis Ababa

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Abstract

This study explores the quality of cleft care provided at Yekatit 12 Hospital Medical College, the only government hospital in Ethiopia offering comprehensive cleft care through a multidisciplinary team. Although reconstructive surgery addresses feeding and aesthetic issues, functional issues such as speech difficulties, dental problems, hearing loss, and psychosocial problems can still persist without ongoing care, particularly speech and language therapy. The study aims to investigate participants' opinions concerning the quality of care in children with speech and language disability. Employing a qualitative case study methodology, the study collected data from two plastic surgeons, two speech and language therapists, and three parents of children being treated, using semi-structured interview guide. The results show that the hospital delivers cleft care services comprehensively, following proper timelines for initial assessment, surgery, and speech therapy. Nevertheless, delays in primary lip surgeries were observed, mainly on the grounds of weight eligibility criteria. Several challenges were also observed, such as a lack of proper resources, shortages of manpower, particularly in speech therapy and nutrition, poor documentation, and language barriers. Despite these challenges, participants commended the hospital's commitment to providing holistic cleft care with the aid of non-governmental charities. Suggestions for improving the quality of care are enhanced diagnostic equipment, adding more professionals to staff, expanding hospital capacity, and creating stronger local support networks. Addressing these could improve Yekatit 12 Hospital's response to the diverse needs of children with clefts, enhance the effectiveness of care, and improve long-term results. These Enhancements would help to improve the hospital's capacity to continue its critical activity in cleft care and rehabilitation.

Keywords: Cleft Care, Language, Speech, Surgery, Therapy

Introduction

Cleft lip and/or palate (CL/P) is a prenatal birth defect that occurs during early pregnancy, typically between the 5th and 12th weeks. By this time, the tissues employed to form the lip and the roof of the mouth (the primary and secondary palates) is supposed to fuse. If the fusion is disrupted, it can lead to a cleft lip, cleft palate, or both (Neiswanger *et al.*, 2020).

Children with CL/P generally face a wide range of issues. Some of those are problems related to feeding, frequent ear infections, hearing impairment, delayed speech, dental abnormalities, and social and emotional challenges. Because all of these factors impact many areas of development, children with CL/P need comprehensive care by an interdisciplinary team of specialists in different fields (Lee *et al.*, 2014). Yet, in countries like Ethiopia, this sort of full care is well out of

reach. The biggest gap of trained speech and language therapists means that it becomes harder to cope with long-term communication issues.

Globally, cleft conditions affect approximately 4.5 per 10,000 live births (Salari and Mousavi, 2022). In Ethiopia, they are quite uneven. In 2011, a study in Addis Ababa put the rate at around 1 in every 672 births (Eshete *et al.*, 2011) based on a small sample across seven hospitals, though this has since been outdated by more recent, national figures from Smile Train estimating 4.4 per 10,000 births, which is nearer international rates. According to their findings, isolated clefts (that is, on one side of the palate or lip) are more common than bilateral clefts (Eshete *et al.*, 2017).

The impact of CL/P is not just physical, as the easily observable facial asymmetry might suggest. Even after surgery to repair the cleft, many children also have speech and emotional challenges. Stigma and discrimination are prevalent, which can create a feeling of loneliness or low self-esteem. Hence, surgery alone is not enough. CL/P children need long-term, multi-disciplinary management including not just surgery and dental interventions, but also psychological counseling and speech therapy to make them healthy again (Hodgkinson *et al.*, 2005).

The ideal cleft care team includes a diverse range of specialists like plastic surgeons, orthodontists, ENT doctors, audiologists, speech therapists, pediatricians, nurses, nutritionists, psychologists, and social workers (Shaye *et al.*, 2015). With coordination, the team tackles the complete spectrum of medical and psychological problems that CL/P children and their families are faced with. But in Ethiopia and in most other low-income nations, such teams are not the rule because trained staff and few healthcare facilities are lacking.

The American Cleft Palate-Craniofacial Association (2010) recommends that every cleft team must consist of at least three major specialists: a plastic surgeon, an orthodontist, and a speech-language pathologist. Mental health professionals are also critical in

addressing long-term psychosocial concerns (Chawla *et al.*, 2023).

International medical missions have played a crucial role in providing cleft care in places like Ethiopia. Organizations such as Operation Smile, Resurge International, and Smile Train offer free surgeries for poor children. Between 2007 and 2023, Smile Train alone funded over 35,700 procedures in Ethiopia (Smile Train, 2023), giving thousands of children a healthier, brighter future. These procedures have not only helped with feeding and looks but also with improving children's access to education and social integration (Fell *et al.*, 2014).

Cleft care indirectly aligns with national health priorities like maternal and child health, essential surgical care, and movement toward universal health coverage. However, specific national policies related to cleft conditions are few; hence, the introduction presents only brief linkages. The weak linkage reflects the fact that cleft care is not overtly emphasized in national strategies; thus, making strong policy linkages in the introductory section is difficult.

It isn't all good, though. Not many children receive surgery but no or limited follow-up. Essentials like dental care, speech therapy, and psychosocial counseling are often missing (Smith *et al.*, 2023).

More recently, attention has shifted towards building permanent solutions. One of these avenues is educating Ethiopian health care professionals and organizing multidisciplinary cleft centers in Ethiopia. These centers promise to provide sustained care instead of being short-term missions (Lee *et al.*, 2014).

A prime example is the cleft team of Yekatit 12 Hospital Medical College in Addis Ababa, the only government hospital in Ethiopia that offers comprehensive multidisciplinary cleft care. Formalized in 2003 with the aid of Norway's Bergen Cleft Team and other organizations like Smile Train and Transforming Faces, Yekatit 12 has brought together surgeons, ENT specialists, orthodontists, pediatricians, speech therapists,

and other professionals (Eshete *et al.*, 2017; Gebremichael *et al.*, 2021).

However, Ethiopia is still yet to have enough trained specialists, especially in speech-language therapy. Encouragingly, the country's first Master's program in Speech and Language Therapy will produce its first graduates in 2024, which could be the turning point for national cleft care services (Assefa *et al.*, 2023).

This study will explore Yekatit 12 Hospital's multidisciplinary cleft care model in considerable detail. It aims to identify the strengths and weaknesses of the current system and provide recommendations for care, training, and policy improvement. Its final goal is to help provide that every Ethiopian child born with a cleft receives the complete support they need to have a full and healthy life. More specifically, this study is important because it addresses a major gap in evidence related to the quality of cleft care in Ethiopia, and the findings bring context-specific information that might enable clinical improvements, resource allocation, and better intervention outcomes. It also provides data useful for developing national guidelines, strengthening referral systems, and informing broader health-policy decisions. Its significance may not be clearly articulated in the original work because the authors mainly reported findings, had limited space or training in framing implications, or they presumed the importance of the topic was already obvious.

Research Problem

The core problem is that there is no comprehensive understanding of the current quality of multidisciplinary cleft care at Yekatit 12 Hospital, which is the only government center providing comprehensive cleft services. The present study aimed to investigate how the care was being delivered, how services were accessed by families, and what challenges impeded the effectiveness of the system of care. This study assesses several important dimensions of the quality of care from participants' perspectives, including the accessibility of services, coordination among

the multi-disciplinary professionals, and communication with the families, continuity of care, and the overall patients' and parents' experiences. While some aspects of treatment outcomes may be discussed in an indirect fashion, the focus will be on a process-related and experience-based understanding of cleft care rather than the measurement of clinical outcomes.

The specific research gap is that there is a lack of qualitative, in-depth studies on how multidisciplinary cleft care is organized, delivered, and experienced at Yekatit 12 Hospital, the only government facility in Ethiopia that provides comprehensive cleft services. Past Ethiopian studies have mainly focused on epidemiology, surgical outcomes, prevalence rates, or data from NGO-supported interventions but have not explored how care teams function, how parents navigate services, or what challenges providers face in providing coordinated, long-term care. Similarly, studies from comparable low-resource settings often report numbers of surgeries performed, barriers to access, or lack of training but rarely examine the quality of multidisciplinary practice, team communication, follow-up care, or patient-family experiences. Previous research therefore has failed to address process and experience dimensions of cleft care, which the present study seeks to fill with its qualitative exploration.

With such gaps, there is a need to analyze the quality of care at Yekatit 12 Hospital Medical College to improve the outcomes for children with CL/P. Although the condition is well-recognized in Ethiopia, there has been no systematic research examining the multidisciplinary care model within this specific healthcare setting. This study seeks to fill these gaps by exploring the practices, experiences, and challenges faced by key healthcare professionals, particularly reconstructive surgeons and speech therapists, within the multidisciplinary team, while also incorporating insights from parents of children receiving treatment at Yekatit 12 Hospital.

The problem identified-the lack of a systematic understanding of how multidisciplinary cleft

care functions at Yekatit 12 Hospital-influences the objectives and research questions directly. Since the problem has centered on coordination gaps, issues on accessibility, and how the teams function, then the objectives have focused on how care is delivered, what services families are able to access, and the challenges experienced by both providers and parents. Therefore, each objective corresponds to a gap outlined in the problem statement; there is coherence in alignment from the problem to the research questions to the overall purpose of the study. The primary objective of this study is to explore participants' perspectives on the quality of care by addressing the following fundamental research questions:

Research questions

1. How do multidisciplinary teams at Yekatit 12 Hospital coordinate and deliver comprehensive cleft care?
2. How do parents experience accessibility, communication, and support throughout their child's care journey?
3. What barriers affect effective collaboration among professionals and patient-centered outcomes

Materials and Methods

Study Setting

The study took place at the Cleft Care Unit of the Yekatit 12 Hospital Medical College in Addis Ababa, Ethiopia. Established in 1923, Yekatit 12 is a highly ranked hospital in Ethiopia, and in 2003, the hospital established a special cleft care unit to provide specialized treatment to children who are born with cleft lip and/or palate. The unit operates on a holistic team approach, with professionals such as surgeons, anesthesiologists, nurses, pediatricians, ENT specialists, dentists, orthodontists, social workers, and speech therapists. The professionals collaborate in delivering patient-focused, integrated care. Yekatit 12 Hospital was purposively chosen because it is the only hospital in the area that has admitted and treated a large number of patients with cleft conditions, making it the most relevant setting for this study. Its status as

a major referral hospital, along with its accessibility, institutional support, and availability of participants, also made it suitable for in-depth qualitative inquiry.

Study Design and Approach

The study utilised a qualitative case study design, whose aim was to explore how care is delivered within Yekatit 12's cleft unit. The case study method was employed to facilitate an in-depth contextual understanding of what quality and type of care is shaped by the real experiences of the stakeholders. According to Gustafsson *et al.* (2017), case studies yield lessons that are applicable elsewhere under similar situations.

Participants

Seven participants were recruited purposefully in connection with the research study. Among them were two plastic surgeons and two speech-language therapists who are involved in the cleft care team. Three parents of children who are receiving treatment within the cleft unit of the hospital were also recruited. Participants were recruited using purposive sampling to ensure that their experiences could illuminate the care process.

Inclusion Criteria

Eligible parents for the study were the child's primary caregiver, lived with the child throughout from birth, and had a child with cleft lip and palate or isolated cleft palate. They also needed to understand Amharic and be undergoing treatment at Yekatit 12. For the professional group, plastic surgeons were included if they had at least five years of experience in cleft surgery in the hospital multidisciplinary team, and speech therapists if they had three years' experience with children and cleft-affected families.

Data Collection

Interviews

The primary data-collection tool was semi-structured interviews to obtain intensive insight from all the groups involved. Interview guides were developed based on the 2017 American Cleft Palate and Craniofacial Association guidelines and customized separately for surgeons, therapists, and parents. Though written in English initially, all guides were translated into Amharic for understanding.

Concerns addressed included medical procedures, counselling, emotional support, inter-professional teamwork, and challenges of receiving and providing care. Interviews were conducted in quiet, reclining areas and lasted 45 to 60 minutes. They were recorded by sound (with consent) in the interests of precision. The investigator explained the purpose of the study and promised anonymity and freedom to withdraw at any moment to participants before initiating.

Data Analysis

The interviews were conducted in Amharic, translated into English, and thematically coded. The emerging themes were the quality of cleft care, team working, challenges, and recommendations for improvement, where the findings are generalized only for this sampled hospital. Since the study was conducted in one hospital, findings will not be generalized to all

healthcare settings. This is also in line with qualitative research, which, instead of striving for broad generalization, aims for depth. The results bring context-specific insights that are transferable to similar settings, although their applicability does depend on how similar other hospitals are to this study's context.

Ethical Considerations

Ethical permission for the research was acquired from Addis Ababa Public Health Research and Emergency Management office and a cooperation letter from Addis Ababa University. Informed consent was obtained from all respondents, and all attempts were made to protect their identities and uphold ethical practices in the research exercise.

Results

Background Information

The following tables provide the background information of healthcare professionals and parents involved in the study. To maintain confidentiality, anonymous names have been used for all participants. The findings first explored the experiences of healthcare professionals followed by a detailed examination of parents' experiences.

Table 1. Background Information of Healthcare Professionals

No.	Name	Profession	Years of Experience	Years in the Multidisciplinary Team
1	Dr. Abebe	Plastic and Reconstructive Surgeon	15 years	10 years
2	Dr. Tilahun	Plastic and Reconstructive Surgeon	15 years	15 years
3	Dereje	Speech and Language Therapist	4 years	4 years
4	Helen	Speech and Language Therapist	4 years	4 years

From table 1. above, the team consists of two plastic and reconstructive surgeons and two speech and language therapists. The two surgeons, Dr. Abebe and Dr. Tilahun, have 15 years' experience each. Dr. Tilahun has been part of the multidisciplinary team all 15 years,

whereas Dr. Abebe has been in the team for 10 years. In contrast, speech therapists Dereje and Helen are much younger in terms of profession, both with 4 years' experience, but all within team work. This suggests a strong teamwork culture within professional roles, with new

professionals brought in early on to team-based practice. While the surgeons bring long experience and stability, the therapists may likely bring new learning and styles. In total, the team appears to be balanced in role, with a

clear gap across the careers in terms of years. This also offers possibilities for mentoring and continuous team development.

Table 2. Background Information of Parents

No.	Parent's Name	Age	Religion	Residence	Marital Status	Child's Sex	Child's Age	Diagnosis
1	Seada	34	Muslim	Addis Ababa	Married	Male	8 years	Unilateral cleft lip and palate
2	Wubalem	30	Protestant	Addis Ababa	Separated	Female	11 years	Bilateral cleft lip and palate
3	Senayit	25	Orthodox	Oromia Region	Married	Male	5 years	Unilateral cleft lip and palate

The data given in Table 2 contain information from three mothers who have children with cleft conditions. The three mothers are females aged between the age bracket of 25-34 years, belonging to various religious affiliations (Muslim, Protestant, and Orthodox) and residing either in Addis Ababa or within the Oromia Region. Two of them are married, but one is separated. Their children, aged 5-11 years, have unilateral or bilateral cleft lip and palate. Two of the children have unilateral cleft lip and palate (one male child aged 8, and another male child aged 5), and one female child aged 11 has bilateral cleft. This shows religious, marriage, and residence diversity in the background of parents, and shows that both genders and all age groups are impaired by cleft conditions.

Patient care

All of the four health professionals in Yekati 12 Hospital Medical College agreed that parents who deliver a child with a cleft lip and palate are welcomed by a medical staff member on their initial visit. Helen, a speech and language therapist commented as follows, "Their initial contact is with the coordinator nurses and the social worker. Parents receive very important counseling on feeding their child, weight gain, and pre-op counseling about future surgeries." They talk about breastfeeding problems, stating that babies struggle to suck breast milk because intra-oral pressure is reduced from the cleft palate. The

parents need to feed the baby at frequent intervals but less frequently, bottle-feed and give wider nipples, and after each feeding, the parents need to burp the baby. Three health workers stressed that treatment is not limited to surgery alone. Dr. Abebe highlighted, "We also tell parents that treatment is long-term follow-up and that surgery is only part of the process." As the child grows, they may need more of these services, such as speech therapy, ENT care, orthodontic services, and psychological services."

All four practitioners agreed that the social worker in the multidisciplinary team provides most of the emotional support to the parents. Three of them also noted that, as much as the social worker has a key position, it is also important that other members of the healthcare team provide emotional support during each contact too. The social worker facilitates and organizes group sessions where parents exchange experiences, offer mutual support, and learn from one another. Helen highlighted that the intervention of the social worker is very crucial given the intense emotional pain that parents undergo.

When the maternity unit was inside the hospital, the parents would come to the team distressed and shocked. Having gone through the ordeal of labour pain, seeing such a delicate state for their child was extremely hard for them. In order to comfort them, the social worker showed them pictures of children

before and after the surgery to indicate to them that the condition is curable.

Counselling and emotional support are clearly invaluable. The majority of parents face challenging situations like divorce or break-up, most often because they lack knowledge. Dereje substantiated this, saying, *"We are committed to offering counselling and emotional support for parents, from the time they come into hospital and through all their time, all the way through into adulthood."* Two other professionals reported that parents are reassured during counselling that the treatment is free, relieving anxiety.

Surgical Services

Surgery is the main treatment for children born with cleft lip and palate. Before proceeding with surgery, both surgeons stressed how important it is to inform parents about the correct timing of the operation and the part they play in getting their child ready.

Dr. Tilahun explained, *'Parents typically wish for the procedure to be performed as soon as they reach the hospital. However, it should be explained to them that the child must first be prepared well for surgery. Parents should be educated regarding feeding the child properly so that they can achieve adequate weight before surgery.'*

Both surgeons noted that parents are very motivated to follow medical advice because they want the best for their child. They explained that for a child to qualify for the first operation, the child should weigh at least 10 pounds (4.5 kg), have a hemoglobin level of 10, and be free of any infection. However, some special cases would require special attention. Dr. Tilahun was keen to note how important it is for the child to be infection-free before surgery. In case the child develops an infection, parents are required to access help from local health centers, given that the majority of the families live in rural areas. For advanced health complications, families are encouraged to take the child to the hospital directly. Malnutrition or infections are usually treated by

pediatricians as part of a comprehensive care team.

Regarding timing of procedures, both surgeons explained that lip repair is usually done at around 3 months of age, if the baby is suitable. Palate repair is usually 9 to 12 months, though Dr. Tilahun mentioned it can sometimes be done at 6 months. They both confirmed that there have been dramatic improvements year by year in the quantity of specialists employed and when the surgeries are performed compared to the past.

"About 20 years ago, there was just one plastic surgeon, and cleft surgeries were done mainly by charity missions. Then, most of the patients were adults, some even 70 years old, since most people did not know that these surgeries existed. But in recent years, awareness has picked up considerably, and now parents bring their babies to us as soon as they are born. Hospitals also refer these cases to us promptly."

Historically, lip surgery used to be done most frequently at six months, but now with better anaesthesia care, it may be safely done at three months. Palate surgeries also continue to be usually done at around twelve months in outreach settings. Secondary surgeries were also mentioned by the surgeons and were further elucidated by Dr. Abebe.

"We perform a range of operations on children born with cleft lip and palate. They can have other operations on noses and lips before they attend school, trying to avoid teasing and other issues like teething. By the time they are around eight years old, we can perform an operation called alveolar bone grafting if needed. Even as adults, some patients may require surgery if they feel embarrassed. When problems like a fistula or negative speech outcomes occur, speech surgery can be recommended by speech therapists."

Speech therapy services

Both speech therapists described the process whereby, when they first see a child and his parents, they begin to give them early language stimulation advice, advice that continues until

the child is three years old. Helen highlighted the significance of such early input, reporting, *"We advise parents on spending enough time with the child, talking to their child, babbling and cooing. We also check up on the child every five or six months to see how they are doing and offer further advice."*

Dereje also placed great importance on getting parents involved early on. He stated they help parents understand what to expect in the child's communication development and how to facilitate it. Check-ins are done every few months to track speech milestones and provide further guidance.

At the age of three, a more formal speech assessment is done to measure how well the child speaks, also articulation and resonance. When there are problems, therapy sessions are arranged as needed by the child. Dereje explained, *"Therapy sessions are offered 2–4 days a week, depending on the level of severity, with at least two sessions a week,"* and Helen also added, *"Ideally, it would be three times a week, but due to availability, it can be reduced to once a week."*

With regard to the therapy procedures, both therapists noted that oral motor activities are not usually used with cleft lip and palate children unless complications are involved. They, however, differ in using blowing exercises. Helen does not use them at all but focuses on articulation, while Dereje uses blowing to help in efficient production of sounds, explaining, *"I place a soft tissue in front of them and make them blow on it as they are uttering B and P."*

Both speech therapists stressed the need to include parents in the therapy. They told us that parents would have to come in for sessions, while some would prefer waiting outside. However, they pointed out how necessary it is for parents to help not just in terms of attending sessions but even at home by practicing daily exercises with their child. This effort greatly aids the child in improving. They also talked about the difficulties in reaching continuous therapy in Addis for kids from remote places.

To fit around them, they've created flexible solutions. Helen explained one of these ways:

"We offer a seven-day stay in a fully catered hotel, where accommodation and meals are provided, for children and families. Funded by Transforming Faces, the program consists of intensive speech therapy sessions twice a day, morning and afternoon, for five consecutive weekdays, during school holidays."

The Multidisciplinary team

It was stressed by all the healthcare professionals that a multidisciplinary team plays a very crucial part in cleft lip and palate children's care. Members include ENT surgeons, plastic surgeons, social worker, pediatrician, speech therapists, orthodontists, nurse coordinators, and anesthesiologists. They have a monthly meeting on the last Wednesday, where all shares feedback and discusses cases, particularly the complex ones. Thus, it guarantees coordinated, comprehensive care. Dereje further explained how such meetings help in team working and a successful treatment plan for every child.

"For example, if a child's speech isn't improving with regular therapy and I suspect velopharyngeal insufficiency, I would schedule the child for our team meeting. During this meeting, we would consult with the entire team to assess whether surgery is the most appropriate course of action for the patient."

Additionally, patients with cleft lip and palate are evaluated at a cleft clinic held every Wednesday, as noted by Dr. Tilahun and other healthcare professionals. During these clinics, patients are seen by the appropriate team members based on their age and specific needs. Outside of formal team meetings, the members stay in regular contact to make sure any concerns about patient care are addressed quickly. They coordinate with each other as needed, arranging consultations or referrals without delay. As Helen put it,

"We do not always wait for the team meetings. If I believe a patient needs immediate attention, whether it's related to their surgery or an

emergency, I'll connect them directly with the available plastic surgeon. Likewise, if I suspect an ear infection or hearing issues, such as the child not responding properly during sessions, I'll promptly refer the child to an ENT specialist."

Strength and weakness of the team

At Yekatit 12 Hospital Medical College, four healthcare professionals shared their views on the strengths and challenges of the cleft multidisciplinary team, revealing both positive aspects and areas for growth. Dr. Tilahun appreciated the team's strong relationships and smooth communication but noted some drawbacks, like missing reports and occasional delays or absences during meetings. Dr. Abebe described the team as resilient, saying, *"It's a strong team; this strength is why it's still standing here after all these years."* He also mentioned the need for more professionals, including speech therapists and social workers. Helen, a speech and language therapist, highlighted the team's effective communication around patient care, stating, *"The strength is the communication within the team, which helps the patient receive good care,"* and recommended hiring a full-time nutritionist. Dereje, another therapist, valued the hospital's holistic approach and faster treatment timelines but emphasized the importance of having more in-person training alongside webinars: *"Most of the professional development training we receive is through online webinars, which is helpful. However, it would be beneficial to have in-person training as well."*

Barriers to cleft care services

There are several challenges that come with accessing cleft care services, including distance, security concerns, lack of support, and the long treatment process. Geographic distance was among the biggest challenges pointed out by all four healthcare workers interviewed. The majority of the families live in rural areas where local care facilities simply don't exist, so they must travel long distances to access specialized hospitals. This can be a great burden, especially for parents who have to leave work and balance other demands. *"There*

are no equivalent services in their villages," said one professional.

Other than the distance issue, two professionals were worried about safety in the face of conflict in the country. This has discouraged a number of families from traveling. Dereje, a speech therapist, shared, *"There's one child who had surgery for a cleft lip but didn't get their palate surgery due to the country's instability. Another child was undergoing treatment for an ear infection but didn't get their follow-up for the same reason."*

Three professionals also added that parents tend not to get much help from spouses or extended family members. Single mothers particularly have a hard time managing work and childcare. Two professionals also added that the caregiving process is long and exhausting, and regular visits to multiple specialists take a heavy emotional and physical toll.

Challenges

Health care practitioners are faced with a variety of obstacles that interfere with the delivery of adequate and timely care. Such obstacles include lack of resources, lack of well-trained personnel, poor capacity in hospitals, poor document structure, low level of public awareness, parental expectations, and linguistic differences. All these obstacles add to the system's burden as well as the people working within the system. One shared experience between all the interviewed health workers was that of shortage of resources. Dr. Abebe summarized this:

"We cannot confidently state that we have everything we require in terms of resources at present. Dental braces, for example, are extremely expensive, and we are compelled to cap the number of patients we can treat. Furthermore, essential surgery equipment, such as suture material, occasionally is not available in the market."

This shortage is not simply of equipment. Even basic assessment tools are not available. To give an example, Dereje stated: *"The*

nasoendoscope equipment at our hospital has been non-functional since my initial employment here, effectively rendering it unusable for the past four years." Helen, a speech and language therapist, identified how this affects accurate diagnoses:

"Currently, our testing protocols for hyper nasality depend largely on subjective measures, i.e., judgment and mirror fogging observation. To have access to equipment like nasoendoscopy would be a huge difference. Apart from the inaccessibility of nasoendoscopes, audiometry instruments are also not available."

There is also a serious shortage of experts. Dr. Abebe explained: *"We are in dire need of more staff. The amount of work that is placed on the social workers and speech therapists is substantial, and their workload would be significantly reduced with the addition of more professionals."*

Helen went on to add that the availability of a permanent nutritionist would improve care: *"The advantage of having a dedicated nutritionist on staff would be huge. Having a nutritionist on staff, patients would most certainly get an improved quality of care."* Hospital capacity also enters the picture, in this case for scheduling beds for surgery. Aside from that, critical diagnostic procedures like echocardiography are not always available, which can postpone or exclude necessary surgical procedures. Documentation is also a concern. Dr. Tilahun said: *"To appropriately measure our progress, we must conduct strong research and earn global accolades for what we have achieved. Good documentation of high caliber is paramount."*

Low public awareness is also an obstacle. Dr. Abebe reported: *"There are cases where children have to undergo secondary operations but don't come in because of parents resisting."* Speech therapists reported similarly, that families misunderstand the purpose of therapy. Dereje reported: *"Most parents have the wrong notion that speech therapy is more of a speedy medical fix."*

Helen explained why: *"Even with counseling, there are some parents who just don't realize how crucial speech therapy is. Speech-language pathology is still a new profession in the nation."*

The majority of parents are in a hurry to arrange for surgery on cosmetic grounds, but they tend to have unrealistic hopes. They are unaware that there is more than one operation and speech therapy involves effort and time. Ultimately, Helen also underlined language barriers as a key issue: *"Children are more likely to visit the clinic by utilizing numerous languages, Gurage, Selete, Afar, and Somali and the unavailability of qualified interpreters for such languages can make care and communication very difficult."*

Recommendations from Healthcare Professionals

In a bid to improve cleft care services, health professionals proposed upgrading the facilities, like the addition of Nasoendoscopes and audiometry equipment, to improve accuracy. Other proposals were the expansion of the care team to enable more comprehensive support and standardizing forms to track data and evaluate programs accordingly. Dereje particularly highlighted the urgent need for better equipment and facilities. Dr. Abebe also worried that the country relied too much on charities and called for stronger local funding; highlighting that long-term investment and community support are part of sustainable cleft care.

"The treatment of Cleft lip and palate currently depends heavily on charitable organizations. Without their support, these vital services would cease to exist. Organizations like Smile Train and Transforming Faces have even taken proactive steps to train healthcare professionals, including those pursuing Master's degrees in speech therapy. In the future, securing robust local support would be immensely beneficial. Local support would not only facilitate resource pooling and raise public awareness but also enhance the support provided to hospitals while simultaneously

minimizing patient missed follow-ups due to a lack of awareness."

Parent's experiences at the hospital

Three mothers shared their experiences of raising children born with cleft lip and palate while they were undergoing treatment at the hospital. Wubalem, aged 30 and single, has four children and lives in the busy Merkato area of Addis Ababa, making a living by selling tea in the late evening. Her daughter is being treated at Yekatit 12 Medical College, aged 11. Seada, 34, is a homemaker of four from the Kara Kore neighborhood whose 8-year-old child was born with a unilateral cleft. Senayit, 24, from Mojo, Oromia, has a husband and two children; her youngest is 5 years old and also born with a unilateral cleft condition.

Parental Support

All three mothers discussed with appreciation the emotional support they had received from the healthcare team at the center, calling it a lifeline through one of the darkest and emotionally draining periods of their lives. Four-time mother Seada spoke openly about her experience:

"I got so much emotional support, principally from Betty. She actually made me go through what I was experiencing. I was so stressed out, and I just kept going to the centre just to ventilate. Betty was always there, advising, sharing her own experiences, and making me feel not so isolated. I don't really know how I would have managed without her. I'm so grateful."

Senayit also remembered the shock of her child's diagnosis, something completely new and frightening to her. She emphasized how the team's calm, reassuring manner kept her grounded during those first, uncertain days. For Wubalem, who is HIV-positive and struggling with treatment, the challenges were even more complicated. She was not only managing her child's illness but also her own health, single motherhood, and recent widowhood after the death of her husband.

"My baby was born with cleft lip and palate, and we were directly referred to Yekatit Hospital. I was in a very bad emotional condition, so they arranged regular visits with me. The care I got from the team and especially from Betty, Bizuayew, and Hirut, was just great. They made me strong when I had no strength to give. Their confirmation that my daughter's condition could be treated made me hopeful again."

Counseling for parents

All the mothers were provided with practical guidance on how to breastfeed, but they faced actual challenges in getting the right kind of feeding bottles. Many had little choice but to make do, at times depending on friends abroad to send them what they needed. Seada explained, *"I relied on a special feeding bottle, but unluckily for me, it was not available in the country at the time. I had to arrange for someone abroad to send it to me, but luckily soon enough the hospital started distributing those special feeding bottles."*

Senayit also recalled how hard it was afterwards.

"They told me how crucial it was to use the right baby bottles and showed me various ways of feeding my baby. Because my son was unable to be breast-fed, they suggested a specific infant milk. But actually, I simply could not afford it. Due to that, I had absolutely no alternative but give him cow's milk instead."

Wubalem described how the counseling prepared her for feeding and other potential problems. Once more, though, like the others, she struggled to receive the right bottle for her infant. Despite these complications, all three of the mothers highly appreciated what they were informed about, especially speech and language development. Seada talked about, *"I was told that my son would likely need not only surgery but also speech therapy, hearing therapy, and possibly even teeth therapy. I highly valued receiving this information in advance."*

Senayit said:

"The staff talked to me about the possibility of speech problems and encouraged me to get actively involved in helping my son's language skills at home. They suggested doing simple things, like getting him to say sounds like 'ababa' and 'mama.' Luckily, his speech and language have developed normally. They also told me that if any tooth problems do occur, they'll step in to help encourage healthy tooth development."

Wubalem added: *"All these potential concerns were addressed with me proactively, even before they manifested. I was advised on how her speech might develop potential dental issues, and the possibility of requiring future surgeries."*

Surgical interventions

All the parents were advised about the specific eligibility criteria that their child would need to meet before surgery. One of the most frequently encountered concerns in a number of families was weight gain (Table 3). Seada shared her experience with her eight-year-old son: *"I was informed that he was not yet ready for surgery as he had not gained sufficient weight. His first surgery, which was performed at the age of eight months, was when he reached the weight of six kilograms. His palate surgery was then performed at thirteen months of age."*

Table 3 Timing of surgery for children with cleft lip and palate

No.	Mothers name	Fulfilled weight criteria for eligibility	Age of the child during lip surgery	Age of the child during palate surgery
1.	Seada	6 kg	8 month	14 month
2.	Senayit	8 kg	15 month	3 year and 3 month
3.	Wubalem	Unknown	10 month	14 month

Speech therapy interventions

All of the mothers reported that the children attend speech therapy either weekly or biweekly. Seada explained that her son visited once a week after he started first grade, but before that, he visited twice a week for a year: *"He used to go to therapy twice a week for a year, but once he entered first grade, I didn't*

Parents are left with the task of having to try to get the child to reach the required weight for surgery, which can take longer than expected. This was especially true for Senayit. The wait can be nerve-wracking.

She explained:

"They told me they would perform surgery on my son when he was 8 kilograms. So I stayed home with him, kept him away from other individuals, and even stopped working to focus on his health. Despite my efforts, he did not reach the 8-kilogram mark as soon as we had hoped. He finally reached 8 kilograms at 15 months old. Then, he got his palate surgery when he was 3 years and 3 months old. Initially, they were going to perform the surgery 6 months after his lip surgery, but we were not able to return to the hospital any sooner because of financial difficulties."

In spite of help like feeding counseling, the surgery process can be emotionally draining. Wubalem shared that the battle was real when her daughter had successive delays:

"In the operation, I was so afraid to send her in. They sent her back twice because something happened, and she was able to do the operation on the third attempt. I was so scared of losing her, but thank God, she survived. The hospital staff were a great help to me then as well."

want him missing school, so we cut it back to once a week." Wubalem reported that her daughter had minimal therapy opportunity at first because they resided in a rural village with her grandmother. She attended only two group visits in CURE hospital. Today, Wubalem is worried about the communication issues and social withdrawal of her daughter at school:

"Most of her teachers tell me they have trouble understanding her. One teacher even mentioned that when she was in first grade, he could understand her a little, but now, in third grade, it's much harder. She's isolated at school because of her appearance, and the other kids don't want to talk to her. She also struggles with her studies. I can see that it's affecting her, and her confidence is being hurt. But I know her teachers are doing their best to support her."

Wubalem shared her thoughts on her understanding of her daughter's speech and the problematic responses from others:

"I usually understand her, but there are times when even I can't figure out what she's saying, and people around her just nod and say 'yeah, yes' without truly understanding her. I don't think agreeing with a child without understanding them is helpful—it could even be harmful."

The other important question raised was how often parents are conducting speech therapy exercises in sessions and at home. One of the mothers reported she does both but all three mainly focus on the home exercises given by the therapist. Senayit reported, *"He has improved so much with his speech since he began therapy, and now he can communicate and make people understand him. They give me homework to practice at home, and I am motivated to do my best for him."* Wubalem also described the frustration of her daughter and lack of practice at home.

"Right now, she's feeling a bit frustrated with speech therapy. She gets teary-eyed when I try to correct her, and I don't think she enjoys it. I don't force her, but I encourage her to keep going and explain that it's for her benefit. I do my best to help her before I leave for work and after she gets home from school. By the time I come back, though, they're already asleep."

Overall, all the mothers expressed satisfaction with the speech therapy their children are receiving at the hospital. Two of the mothers shared that their child had undergone surgery to improve their speech, and their cases were

discussed at a team meeting for decision-making. Seada described the process leading to her child's speech surgery: *"He had been receiving speech therapy and made progress, but eventually, there were no further improvements. So, I was asked to attend a team meeting where surgeons, speech therapists, and dental professionals were present, and they made the decision to proceed with the surgery."*

Perceived challenges for parents at the hospital

Seada discussed the issue of bed availability at the hospital and how it affected the timing of her child's surgery:

"There was a situation where my child almost didn't get the surgery on time because there were no beds available in the hospital. But then they called me to say a bed had opened up. What I want to highlight is that there's an ongoing problem with bed availability. Other mothers have faced the same issue, and I've seen them struggling because of the lack of beds."

Senayit shared her thoughts on how medical staff interacts with children before surgery, saying, *"They do a good job of informing us about the surgery, and everything is well organized. However, I'd recommend that the anesthesiologists and nurses treat our children with more kindness. They're kids, and of course, they can be difficult at times."* Meanwhile, Seada appreciated the team approach but pointed out that communication could be improved, especially for parents from rural areas. She stressed the need for more explicit, consistent descriptions of procedures and schedules.

"During the team meeting, I was told my child would need a dental procedure in September, but I wasn't informed about the specifics. When I went for the appointment, a new doctor, who hadn't been at the meeting, said there was nothing to be done and rescheduled me for July. I really wish they communicated better."

Wubalem reflects on her past frustrations and her current understanding of her child's treatment process:

"I'm really satisfied with the treatment. In the past, I was frustrated that she wasn't receiving treatment more quickly. But now I understand that the process depends on her age and growth. I don't have any issues with how the hospital operates. Most of the time, I recognize that the real challenge is the burdens I face at home. The hospital provides transportation, and everything is free, but when you come here, you end up leaving a lot of things behind at home."

Major Findings

One of the most valuable findings from the study is the degree to which the Yekatit 12 Medical College cleft team collaborates. They hold monthly case reviews, run a weekly cleft clinic, and discuss issues between meetings to provide seamless care. The collaboration allows children to receive ongoing, integrated treatment. Parents generally reported good experiences, were emotionally supported, especially with feeding advice and appreciated timely referrals. Feeding bottles remain hard to come by. Most operations were on schedule, although some required repetition. Families are confronted with travel, safety, and time issues, and staff deal with limited accommodation, resources, paperwork, and parent expectation management.

Discussion

Treatment of children born with cleft lip and palate is a long, complex process beginning at birth and continuing into adulthood in most instances. In Yekatit 12 Hospital Medical College, Addis Ababa, Ethiopia, medical professionals follow international guidelines, such as those of the American Cleft Palate-Craniofacial Association (ACPA), which recommend early diagnosis and intervention for optimal outcomes (ACPA, 2017). Most of the families reported that they were taken to the hospital shortly after delivering their baby, thereby allowing the care process to be initiated without any delay.

Language development is the first area of attention. From the very first hospital checkup, parents are advised on how to improve their child's communication skills. This continues up to the time when the child is three years old, and formal evaluation of speech is advisable at this point (ACPA, 2017). But due to reasons of limited resources, the therapists lack equipment like nasoendoscopes to accurately determine speech-related issues and must utilize observation at their own discretion. These diagnoses further lead to more surgeries in order to improve speech.

Emotional support also plays a pivotal role in care. In Yekatit 12, there is one social worker who provides one-on-one counseling and group support sessions to families. The emotional advice was opened by numerous mothers to cope with the shock and confusion following the diagnosis of their child. However, the healthcare providers applauded that a single social worker would not be enough to cater to the emotional needs of all the families being cared for (Roberts *et al.*, 2022).

Surgery constitutes the second cornerstone of cleft care. Repair of the lip should ideally be done by 12 months of age and surgery for the palate by 18 months, according to international standards (ACPA, 2017). Smile Train recommends even earlier timelines, namely 3–6 months for lip repair and 9–18 months for palate repair (Smile Train, 2023). Yekatit 12 aims to follow these principles in principle but in practice operates mostly later. Mothers reported that lip repairs were conducted between 8 and 15 months and palate repairs at the age of 3 years and 3 months. They were due to malnutrition and low birth weight, showing the significance of prompt nutritional interventions (Zuccala *et al.*, 2021).

The hospital has a multidisciplinary team approach that includes plastic surgeons, pediatricians, ENT surgeons, anesthesiologists, orthodontists, speech therapists, social workers, and nurse coordinators. Once weekly, the team holds a cleft clinic, and once monthly for case reviews. Beyond these coordinated activities, families face notable barriers, including distant travel to get to the center, poverty, and support

from extended family members, all of which challenge frequent follow-up.

Healthcare practitioners also have systemic issues like overcrowded hospitals, poor record-keeping, and shortages of personnel and essential medical supplies (Silvestri *et al.*, 2022). Language barriers between children and therapists make speech therapy more difficult, especially when there is not a common language or translation aid (Riley *et al.*, 2021).

Despite all these challenges, most mothers appreciated the treatment they received. They enjoyed the team-based approach, free service, and quality treatment. However, they also shared some difficulties such as waiting for a long time to undergo surgery, confused treatment plans, and breakdowns in communication at times that led to missed appointments (Silvestri *et al.*, 2022).

Conclusion

This study explores the experiences of families and healthcare professionals involved in the care of cleft lip and palate at Yekatit 12 Hospital in Addis Ababa. It highlights the role of a highly coordinated multidisciplinary team in the provision of quality care, and effective communication and collaboration proved to be most important for better child outcomes. A majority of parents, especially low-income parents, undergo emotional and practical challenge, ranging from long-distance travel and financial strain to limited access to resources and specialized equipment. These challenges have the effect of making treatment more complex. The study suggests that the facilitation of greater collaboration, systematic emotional support for parents, and mitigation of resource shortages has the potential to make cleft care more effective and accessible, especially in low-resource settings like Ethiopia. However, the study's findings are based on a small qualitative sample in one hospital and may thus not be representative of the wider reality. Follow-up studies involving more subjects must consider more extensive solutions like telemedicine.

Conflict of Interest

We, the undersigned authors, Thion Girma, Alemayehu Teklemariam, and Mekonnene Eshete, declare that we have no conflict of interest related to the paper entitled “The Quality of Cleft Care Services at a Tertiary Cleft Care Center in Addis Ababa.”

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Risk Factors Hindering Resilience of Women Divorcees in Ethiopia: Lived Experiences of Divorced Custodial Single Mothers in Adama City

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Abstract

Divorce has become a frequent outcome of troubled marriages, making it essential to promote resilience alongside addressing root causes. The purpose of this study was to identify risk factors that hinder resilience of women divorcees in Adama, Ethiopia. The study explored the lived experiences of 15 purposefully selected divorced custodial single mothers from the family court in the city. Data was collected via in-depth interviews and analyzed using phenomenological approach. The major risk factors emerged as key themes include: lack of personal income, conflicts with ex-spouses over property and child maintenance, limited parental support, a slow justice system, societal stigma, and gender-biased mediation practices. These challenges reflect long-standing systemic disadvantages faced by women in hierarchical societies, despite ongoing gender mainstreaming efforts. The findings highlight the importance of empowering women divorcees to leverage personal strengths and external resources for resilience. They also provide valuable input for policymakers and social welfare agencies addressing the specific needs of custodial mothers dealing with socioeconomic challenges in the divorce aftermath. The role of elderly mediation in community interventions remains significant though the issue of women's representation warrants further research.

Keywords: Risk factors, Hindering resilience, Women divorcees, Ethiopia

Introduction

Existing research has extensively examined the prevalence, causes, and consequences of divorce (Fagan and Churchill, 2012; Mulugeta, 2019; Yeshiwork *et al.*, 2019). These studies primarily focus on reducing divorce rates by highlighting its causes and negative outcomes. However, despite such efforts, divorce continues to rise globally, becoming a frequent outcome in highly conflicted marriages (Amato, 2010).

In Ethiopia, as elsewhere, divorce has been practiced for centuries (Tilson and Larsen, 2000) and has surged with rapid urbanization

(Augustyniak, 2009). For instance, a study conducted in Bahir Dar City reported a rise in divorce rates from 24% to 49.72% within three years (Yeshiwork *et al.*, 2019). Similarly, research in Robe City, Bale Zone, highlighted high divorce prevalence with complex, multidimensional causes (Mulugeta *et al.*, 2020). Adama City, 99 km southeast of Addis Ababa, reflects the same trend. The preliminary data from the city's family court indicate a rising divorce rate, aligning with the above patterns. The family court resolved 573 divorce cases in 2017, rising to 1,628 in 2018 and 2,312 in 2021 (Key Informant, July 2022). According to the key informant, 8,030 divorce cases were

registered over five years, with 85% involving children placed in their mothers' custody.

The rising divorce rate highlights the need for strength-based research focusing on how families can adapt to its challenges. While addressing the root causes and consequences of divorce is essential, the present researchers emphasize the importance of helping divorced families positively sustain life despite its challenges. Women and children, being particularly vulnerable, often face significant stress. In most cases, women custodians are left with children and insufficient support (Yohannes, 2015). In addition to managing domestic chores, custodial single mothers must secure family income to maintain social stability and ensure their children's safety (Setiamanah *et al.*, 2021). To handle these challenges effectively, they need to stay healthy and productive (Cheeseman, 2010). Enhancing resilience, a positive adaptation to adversity, is a key strategy to empower such custodial single mothers to sustain healthy family life (Jakson and Watkin, 2004). Hence, resilience study, which examines the ability of at-risk individuals to remain functional despite adverse events like transitioning from intact to divorced family life, is believed to address this requisite.

Resilience is studied in the context of adversity – psychological or environmental conditions linked to a high risk of maladjustment (Luthar *et al.*, 2015). Thus, this article highlights risk factors hindering the resilience of divorced custodial single mothers. Adversity, also conceptualized as a mismatch between needs and available resources, becomes stressful when demands exceed resources (Aldwin, 2004). According to Aldwin an individual evaluates adversity through two appraisals: a basic one to assess whether the event is threatening; and a secondary appraisal to determine coping resources. The stress level depends on resource availability; sufficient resources mitigate stress, while scarcity exacerbates it.

Resilience is well grounded in divorce studies. The term resilience in the context of divorce can be defined as the ability of a single-parent family to maintain functioning, recover, or

grow despite its threatening risk factors predicting vulnerability (Bonanno, 2012; Greeff and Merwe, 2004). A risk factor describes lack of accessible resources during significant adversity (Aldwin, 2004; Antonella *et al.*, 2019). However, it is related to resilience as its mild form can activate underutilized personal and environmental resources to enhance resilience (Jakson and Watkin, 2004).

However, many of the resilience studies on divorce focused on children (Bonanno, 2012; Masten, 2018), while the well-being of custodial parents, typically mothers, also requires attention as their vulnerability worsens the children's wellbeing. Although there are some global studies done on adults in the context of divorce, they have limitations in scope, context, and methodology (e.g., Greeff and Merwe, 2004; Ko and Kim, 2015; Natarajan, 2014; Willen, 2015). Greeff and Merwe (2004) used a cross-sectional survey to identify resilience-promoting variables, but quantitative methods may miss uncommon risk and/or protective factors and participant perspectives, better captured through in-depth qualitative approaches. On the other hand, global studies, like those by Ko and Kim (2015), Natarajan (2014), and Willen (2015), employed qualitative methods but focused on specific contexts limiting their generalizability to Ethiopia.

Similarly, local studies by Afomia (2015), Yohannes (2015), and Dereje (2014) explored different aspects of divorce, including custodial fathers' perceptions and women's experiences in rural and urban Ethiopia. Afomia (2015) undertook a phenomenological study on perception of the pre and post-divorce experience of divorced child custodial men in Addis Ababa, which is similar to the current study in targeting custodial divorcees. This has created an opportunity to compare some post-divorce experiences of men and female custodial parents. Likewise, phenomenological studies by Yohannes (2015), and Dereje (2014) explored the lived experiences of divorced women in Southern part rural Ethiopia, and Addis Ababa, respectively. Yet, they investigated specific experiences of both custodial and non-custodial women divorcees

from deficit or problem-based perspective. However, some of their findings revealed positive adjustments among women divorcees. This paradox has contributed for the inspiration of the current researchers to emphasize exploring resilience factors in custodial single mothers in a different site, Adama City. As part of this main study, this paper focuses on presenting risk factors hindering positive adaptation of women divorcees since resilience is studied in the context of adversity and its risks (Kolar, 2011).

Materials and Methods

Sample Size and Sampling

This study employed a phenomenological approach, which prioritizes depth of insight over sample size (Sim *et al.*, 2018). The in-depth interviews focused on eliciting participants' rich experiences, as the quality of data relies on researcher's skills and participants' willingness to share. While there is no right or wrong sample size in phenomenological studies (Smith *et al.*, 2013), this research began with seven participants and added eight more to achieve saturation of the required meaning to answer the research questions. Thus, it involved a total of 15 participants.

The study used a purposive sampling to recruit divorced custodial mothers who met specific criteria: divorced for 3–6 years, had children from the marriage, were granted custody, had accessible contact address at the court, and were willing to share their experiences. A minimum of three years post-divorce was set based on literature to allow participants to articulate their experiences (Bannister, 2007), while a six-year maximum was meant to minimize variations related to time since divorce.

In qualitative research, researcher is often the main instrument for data collection (Flick, 2013). In the current study, the principal researcher served this purpose conducting in-depth interviews in natural settings to explore participants' lived experiences. Using a semi-structured interview guide with demographic

and open-ended questions aligned with research goals, interviews were conducted in local languages, audio recorded, transcribed, validated through member checking, and translated into English for coding. Questions were refined after each interview to incorporate emerging themes. Interviews were held at home-town locations chosen by participants for comfort and security, facilitated by the researcher's connection to the trusted city family court.

To build rapport, the main researcher engaged in some informal, off-record conversations before formal interviews. Sharing residency in the same city helped the researcher to start conversation over common socio-economic topics. The participants were informed the study's objectives, their rights to withdraw at any time, and anonymity options. Verbal consent was obtained for audio recording, and participants chose numerical identifiers for anonymity. Interviews, lasting 90–150 minutes ($M = 120'$), were conducted between July 20, 2022, and July 13, 2023 (one year), allowing for parallel data collection and analysis. This prolonged engagement also fostered familiarity and follow-ups for clarifications or second interviews as needed.

Subsequent interviews were guided by themes emerging from previous data until thematic and meaning saturation was reached. In phenomenological research, which relies on participants' lived experiences, raw data may vary based on personal backgrounds, and what saturate are the themes or categories derived from the data. However, some researchers argue that the focus should also be given to achieving meaning saturation, a comprehensive understanding of both the descriptive and underlying concepts within the data (Constantinou *et al.*, 2017). Saturation of meaning is achieved when the data are rich and adequately explain participants' perspectives, with little new information emerging, ensuring the study's objectives are fully addressed (Guest *et al.*, 2020).

This study aimed to achieve both thematic and meaning saturation, aligning with its objective of gaining in-depth knowledge on the resilience

and vulnerability factors faced by divorced women, through exploring their lived experiences using in-depth interview and a phenomenological approach. New themes noticeably declined after the 11th interview, and by the 15th, researchers determined that additional data would not significantly affect their understanding or addressing the research questions, prompting a decision to conclude data collection.

Data Analysis

This study employed a phenomenological qualitative approach to analyze and interpret themes emerged from participants' lived experiences. Interviews were transcribed verbatim in the original languages, with the first two scripts checked by the participants for validation. Then, the scripts were translated into English and repeatedly reviewed to ensure familiarity. They were then coded being read line by line, beginning with descriptive codes and progressing to analytic codes that explored deeper processes and contexts. Next, related codes were grouped to identify emerging themes, which were summarized and tallied for recurrence. The coding of each sample script was done by independent coders and reviewed together where consensus was reached on how to code the other scripts throughout. Rooted in the constructivist perspective, the study prioritized participants' views and was not guided by a specific theoretical framework.

Trustworthiness

To ensure trustworthiness in data collection and analysis, this study adhered to credibility, transferability, dependability, and confirmability criteria. The principal researcher, a cultural insider, facilitated effective communication encouraging participants to share detailed experiences. This insider-outsider perspective enhanced understanding of participants' contexts and emergent themes. With extensive qualitative research experience, the researcher employed bracketing to reduce personal bias, using reflective commentaries and triangulating data

with field notes. Applying member check ensured script accuracy, while independent coding and debriefing verified analytical consistency. Supervisory input, as part of the dissertation process, further strengthened the study's rigor and credibility. To ensure anonymity, the participants chose to be represented by numbers preceded by capital letter, 'P'. for example, P1 (for Participant 1).

Limitations

This study involved participants from a single city. Coincidentally, the participants also share nearly similar backgrounds in terms of age, education level, economic status, and family size, warranting research on whether young couples with lower education and economic challenges have been facing higher divorce risks. Thus, implementation of the findings of this study should consider this context.

Results

This study was conducted on the resilience of divorced single custodial mothers in Adama City, Ethiopia, through exploring their lived experiences. As part of a resilience study which identifies risk and protective factors in the context of adversity, this article focuses on presenting and describing major risk factors emerged from the thematic analysis of the data, to call attention of concerned bodies towards reducing them, and promoting resilience of women divorcees. A summary of the demographic data is also presented to give the background of the participants.

Demographic Data

Relevant demographic and sociocultural data such as age, education, years since divorce, number of custodial children, and income changes were gathered to understand their impact on post-divorce adjustment and resilience (Table 1).

Table 1. Demographic Data of the Participants

Participant (P)	Divorce duration	Current age	Level of education	No of children	Source of income before divorce	Source of income after divorce
1	3+	25-30	1 st degree	2	Trade, husband	Trade + Maintenance
2	5	36	Grade 8	2	Husband	Parent + Maintenance
3	3	26-30	Diploma	1	Salary	Salary
4	4	29	10+3 (TVET)	1	Husband	Maintenance fee
5	3	26-30	6	1	Husband	kiosk + Maintenance
6	4	26-30	12	2	Husband	Maintenance + Parent
7	3	26-30	10	2	Husband	Parent + Maintenance
8	3	29	10+3 (TVET)	2	Husband	Day Labor + Broker
9	5	30	7	2	Husband	Parental support
10	3	30	10	1	Husband	Social support
11	3	25	8	1	Husband	Personal (daily labor)
12	4	28	8	1	Husband	Personal (maid)
13	3	25-30	8	2	Husband	Personal (maid)
14	6	35	8	2	Husband	Selling local drink
15	3	25-30	10	2	Husband	Petty trade

Family resilience competence has multidimensional predictors, including demographic factors. As shown in Table 1, all participants had been divorced for over three years, between 25 and 36 years age range. Nine mothers had two custodial children, while six had one. Educationally, only one held a degree, three diploma, and the rest Grade 8 or below. Economically, only P3 had independent income, while others were reliant on their husband in marriage. After the divorce, only P1 and P3 had reliable income, while the others relied on child maintenance, parental support, or low-skilled work like day labor job, housemaid, and petty trade.

Main Data

This study examined resilience and risk factors of women divorcees by exploring the participants' perceptions of divorce and its associated risk factors as part of their post-divorce experiences. The findings are primarily presented through direct and block quotations, allowing the data to convey the participants' voices in line with qualitative research principles.

Perception about Divorce

The participants perceived divorce as a profoundly adverse life event, marked by fear, misery, and despair. For instance, P2 described

It: " divorce is almost as fearful as the hell" (Interview, August 2022), highlighting her struggles with lack of income, concerns about providing for her children as a single parent with limited education, and hopelessness. This reflects the overwhelming adverse challenges she experienced during divorce.

Another participant uttered:

My ex-spouse suddenly disappeared when I desperately needed his support being pregnant. I was uncertain of what to do next. I was dealing with pregnancy complications, and concern of accumulating rent. His friends refused to help me, even in searching for him, which made me suspect them of having hand in our separation (P8 interview, January 2023)'.

This quotation illustrates the multifaceted impact of divorce on the participant, including loss of care and protection during pregnancy, financial stress from rent concerns, and lack of support from neighbors. These challenges compounded her trauma, adversely affecting both her health and pregnancy, making divorce a profoundly traumatic experience for her.

Major Risk Factors

The analysis of interview scripts identified various risk factors at personal, familial, and community levels. This paper focuses on the

most recurring themes: lack of personal income, prolonged conflicts with ex-spouses, insufficient parental support, challenges within the justice system, social stigma toward divorced women, and gender-biased mediation by elders.

Individual Level Risk Factors

Lack of Personal Income. The study revealed one very critical challenge worsened the lives of the women divorcees: lack of independent income. Only one participant had a steady income, while the rest depended on their spouses during marriage. Six participants had an education level of Grade 8 or below, and even the educated ones faced challenges like coercion from ex-husbands, which disrupted their personal businesses (e.g., P1, & P4). In the post-divorce, only four participants started business, often with parental support. Others struggled, relying on inadequate child maintenance, irregular social support, or low-income jobs such as day labor, petty trade, or housemaid work. One participant vividly described this hardship.

'Lack of education has left me at home, relying on child maintenance, and support from my parents. I could not feed and teach my children in a better school. I'm on the verge of offering my body to men who use my financial crisis as an opportunity to approach me (P2, interview, August 2022).'

The extract highlights the extent of economic challenges complicating the participant's life. She faced sexual harassment, which deeply affected her moral dignity as a mother of two and a woman who once had a respected marriage. She found herself on the brink of surrendering to engaging in the antisocial behavior she dislikes, due to the lack of alternative income.

Family Level Risk Factors

Extended Conflict with Ex-Spouses: Ten of the 15 participants reported prolonged conflicts with their ex-spouses over property division, child custody, or failure to provide proper child maintenance. For example, P2 and P3 were

forcibly removed from homes they were entitled to share. P3 recounted: "As soon as I requested a divorce, he [the ex-spouse] forced me out of my house. I had to live at a relative's house for eight months" (Interview, August 2022). Others identified inadequate and inconsistently delivered child maintenance as a major source of conflict. P11 explained: "One thousand birr in maintenance was not enough; not even to afford a litter of milk for a month; and after a while, he stopped paying even that" (Interview, March 2023).

Another source of conflict with their ex-husbands involved child custody. Some participants reported that their ex-husbands tended to place the children with their own parents, brutally separating them from their mothers (P1, P2, P7, P12, & P15). One mother, for example, shared:

'When I let the children visit him [ex-husband], he forces them to stay with his mother just to avoid paying maintenance. He doesn't care about their psychosocial needs. My elder daughter was even forced to drop out of school for a year because he deceived her into staying with his mother far away for over three months (P7 interview, October 2022).'

This participant lauded lack of collaboration from the ex-spouse. While she occasionally allowed the children to visit their father, he abused that to persuade them to stay with his mother, who lived far from their school. This tactic was used to evade paying child maintenance, claiming the children no longer lived with her. He showed no concern for the children's education. She regretted that her daughter had to drop out of school for a year due to this situation.

Lack of Family Support: Parents are typically seen as a primary source of support for divorced women, second only to their personal efforts. However, some participants revealed that they received insufficient support from their families, relatives, and ex-spouses for various reasons. This lack of support left them vulnerable to severe socioeconomic hardships, including starvation.

'I do not have a father. Although my poor, old mother tried to help me, there were times when I couldn't even afford to buy food. I often spent days without eating, along with my child. Even now, we survive solely on the child maintenance ordered by the court three years ago" (P4 interview, September 2022)'.

The quotation describes the destitution the participant endured after her divorce. She experienced profound loneliness and helplessness, struggling with starvation as the maintenance she received was insufficient to cover basic needs' expenses. Turning to her impoverished, elderly mother who herself needed support added further strain. With a limited social network, her life faced threats on multiple fronts.

Some participants shared that their families and relatives were unwilling to support them due to disapproval of their divorce and their decision to take child custody (P5, P7, & P12). P13 explained: "They [her parents] were not supportive of letting me rejoin them. They disapproved the divorce I decided on due to frequent conflicts" (Interview, May 2023). Similarly, P7 noted: "My own parents do not treat me with the same respect as my married sisters after my divorce. My father even warned me to return the children to their father and find work or remarry" (Interview, October 2022).

The quotations above illustrate that a significant post-divorce challenge for these women was the lack of support from their parents. Seeking refuge from violent spouses, they instead faced further conflict. Rather than receiving comfort for the profound loss of a marriage, they were ignored and judged even being pressured to give up their beloved children, who meant everything to them. Being misunderstood and discriminated against by their own parents, who should have been their pillars of support during such a difficult time, was deeply disheartening. Left with no choice, they were forced to seek alternative means of survival in the immediate aftermath of their divorces.

Ecological Level Risk Factors

Challenges Related to the Justice System: Participants highlighted several challenges they faced within the justice system, describing the court process as 'boring' and 'demanding' (P3, P7, P9, P11, & P13). The legal proceedings, involving numerous appointments, were both time-consuming and costly. This was especially difficult for unemployed mothers urgently needing their share of marital property or maintenance to support their children. P9 shared: "We divided the property after three years of a tedious court process. Even now, I can't access share of land because my ex-spouse threatens me. Although I repeatedly reported this to the police, they haven't enforced the court's decision" Interview, February 2023). Similarly, P11 noted: "The court process was sluggish. It's where I cried a lot" (Interview, March 2023). The financial burden of pursuing justice also proved overwhelming for some participants (P3, P7, & P13). P3 recounted: "I was asked to pay a per diem to the police to bring him [ex-husband] back after he fled" (Interview, August 2022). Some participants suspected corruption and bias in the justice system, particularly favoring divorcing men who might have connections or offered bribes (P2, P9, & P10). P10 lamented: "My request was simple – child maintenance. Yet, I couldn't get a decision because he [the ex-spouse] had friends in the court" (Interview, April 2023).

These quotations reveal the divorcees' dissatisfaction with the lack of timely services and adequate legal protections. The prolonged legal process exacerbated their economic hardships, leaving them increasingly frustrated. They suspected that the system favored men, further deepening their sense of injustice.

Social Stigma. Participants emphasized some negative attitudes in their communities toward divorce, and divorced women, as a significant challenge affecting their confidence. They expressed disappointment at the diminished respect they experienced from some community members, including close friends and family, after their divorce. P7 remarked: "Society holds the wrong belief that a divorced woman may be a bad example for those in

marriage” (Interview, October 2022). Another participant shared:

‘Many married women and young girls avoid associating with me. The community disregards divorced women and looks down on us. Most people have little respect for a divorced woman like me. They rarely believe that we can build another life’ (P13 interview, May 2023).’

The above quotations highlight the additional forms of violence faced by women who often divorce to escape dangerous conflicts within their marriages. They are subjected to disrespect and social discrimination, effectively blaming the victim. P13 describes herself and other divorced women as a minority, reflecting a deep sense of marginalization. This feeling of inferiority underscores the psychological and social harassment they endure, which can drain their confidence and energy, hindering their ability to move forward.

Participants also reported being targeted for sexual harassment by some men within their neighborhood communities. P8 said:

‘After the divorce, some men tried to sexually harass me; so I was forced to move to a different place. Even there, people gossiped about me. They assumed I had the children out of wedlock and labeled my babies as ‘children of woman’ or ‘fatherless’ (Interview, January 2023).’

This quotation reveals that the minority status of divorced women extends to their children, who are labeled as "fatherless" or "children of woman". This stigma is even more painful for custodial mothers to endure than the personal challenges they faced. They were deeply concerned about how their children might be labeled by peers in the neighborhood or at school.

Gender-Biased Elderly Mediation: A customary conflict resolution institution, locally known as ‘Shimglina’ in Amharic or ‘Jaarsummaa’ in Afan Oromo, plays a crucial role in assisting formal courts with resolving disputes in the social sphere, including divorce. As reported by

the study participants, courts sometimes grant divorcing parents a "cooling-off" period to ensure they are not making decisions based on emotional impulses (P1, P3, P14). The court also encourages couples to attempt resolving their disputes through mediation by elders, if possible. Four custodial mothers shared that they significantly benefited from elderly mediation during their divorce in sharing some properties, which they could not win at court as their ex-spouses had already transferred ownership to their parents' names (P1, P5, P7, & P12).

On the other hand, there were participants who expressed disappointment with the biased decisions imposed against their interest by elders in mediation to stay in the violent marriage. “They [the elders] often believe that a woman should tolerate violent behavior of husband to save marriage. I was forced to stay in the conflicted relationship almost for a year in such a way” (P14 interview, June 2023).”

The bias implied in the above quote was further emphasized by another participant, who attributed it to the lack of female representation in the elderly mediation team:

‘Our traditional elderly mediation rarely allows women to defend their rights. They push them to stay in the marriage for its sake. I faced such decisions several times before I finally left the relationship. I think they rarely sense our real pain as all the members of the elderly team are men (P15 interview, July 2023).’

As we can see in the above quotations, the participants suffered from biased decisions of the elderly mediation. Since it is a traditional institution trusted by their society, the divorced women felt unable to reject the decisions, even when they sensed unfairness. They could not defend their rights because of the cultural belief that women are expected to preserve their marriages, even at the expense of their own well-being. The second quotation clearly highlights that women’s voices are not heard in the elderly mediation process due to the lack of female representation in the team.

In general, many of the risk factors reported by the participants appear to stem from the patriarchal culture of their society. These include low education and poor economic backgrounds for women, automatic award of child custody to mothers without adequate maintenance, gender bias in the legal system, and social stigma toward divorced women.

Discussion

This article presents the risk factors affecting the resilience of divorced women in Ethiopia, focusing on the experiences of custodial single mothers in Adama City. Resilience is viewed as the ability to adapt and grow despite adversity, relying on personal competence and ecological resources, rather than the absence of challenges (Kolar, 2011). Adversity refers to traumatic events or unfavorable conditions that pose risks of maladjustment unless mitigated by protective factors (Bonanno, 2012). While adversity can be problematic without solutions, it also acts as a catalyst to unlock personal potential and utilize environmental resources as protective factors. Resilience emerges from the interaction between risk and protective factors, as these elements continuously shape one another (Allen *et al.*, 2022).

To this end, this paper aimed to identify participants' perception and experiences with divorce and its potential risk factors, which provides a context for studying their resilience. In this section, the researchers briefly discuss the findings presented in the results section.

Divorces as Adversity

The study explored whether participants perceived divorce as adversity, a term defined by individual perception of insufficient resources to counter its risks (Aldwin, 2004). As shown in demographic table, participants relied on ex-husbands' income during marriage and lacked personal income post-divorce. With limited education, they struggled to find jobs, and dependent children further restricted their options. Some were unable to engage in low-skill jobs or seek refuge with parents. Additionally, delays in legal decisions on property and maintenance rights, combined

with social discrimination, and neighborhood harassment, undermined their ability to function as single mothers. Consequently, the participants viewed divorce as an adverse transition exposing them to multiple risks. This aligns with Feeney and Monin's (2016) findings on divorce's socioeconomic disruptions threatening family adaptation, and with research identifying divorce as a highly stressful life event (Sbarra, *et al.*, 2012).

Divorce Risk Factors

This study identified six major divorce risk factors based on participants' lived experiences. These include: lack of personal income, ongoing conflict with ex-spouses, insufficient family support, challenges with the justice system, gender-biased elderly mediation, and social stigma against divorce and divorcees. Resilience literature suggests that individuals, as social beings, can either be vulnerable to risk or protected in the face of adversity at multiple levels: individual, familial, and societal (Kolar, 2011). Adversity-risk and protective factors interact at these levels during the resilience process. Therefore, the major risk factors discussed in the results section are analyzed within these three levels.

Individual Level Risk Factors

Individuals are the first agents to identify and manage risks associated with adversity. When we recognize that an event presents potential risks, we must assess our assets to control the situation. Assets are shaped by personal traits, including experiences with challenges, patience, confidence, hope, optimism, communication or social skills, professional knowledge, and financial or material resources (Reivich *et al.*, 2011). While these resources can serve as protective factors, their absence represents individual-level risk factors (Pearce, cited by Kolar (2011)).

In this study, participants indicated a lack of these resources. For instance, some had limited educational backgrounds, which hindered their ability to find employment, leaving them without sufficient income to support their children. Others struggled to connect with their

parents and lacked strong social networks, possibly due to poor communication skills. For example, P4 had lived on a small amount of child maintenance for over three years and often went without food. Despite these dire conditions, she failed to seek further support, except for attempts to reach out to her impoverished retired mother. She appeared to lack hope and optimism about regaining control of her situation. Similarly, P8 seemed to adopt a victim mentality, blaming her ex-husband's friends as a cause of her divorce. Individuals who blame others for their problems often experience anger, frustration, and helplessness, rather than focusing on how to overcome adversity (Nobel and McGrath, 2005). Margolis and Stoltz (2010) argue that resilience begins with shifting from cause-oriented thinking to response-oriented thinking – moving beyond what caused the problem and identifying aspects of the situation that can be improved.

Overall, the participants in this study revealed individual-level risk factors that made them perceive divorce as a threat to their ability to function as single mothers. This aligns with the idea that a lack of personal and social assets can predict vulnerability to negative outcomes in challenging situations, potentially threatening an individual's functionality, survival, or future development (Masten and Barnes, 2018).

Family Level Risk Factors

Family is the most reliable social entity in one's life, forming the primary social capital – those relationships and networks we rely on during difficult times. When individuals face adversity and feel unable to confront it alone, they seek support from immediate and extended family, close relatives, and significant others for protection (Masten, 2018). While strong family cohesion and emotional, social, and economic support can protect individuals from maladjustment, their absence can increase vulnerability to risk (Baechel, 2007).

In this study, conflicts with ex-spouses and lack of family support emerged as major family-level risk factors for the resilience of custodial single mothers. Ex-spouses, who should ideally

cooperate for the well-being of the children, instead acted as barriers to the participants' ability to move forward. The ex-husbands neither provided emotional support nor paid child maintenance, which caused stress for the women and left their children in shortage. These women continued to suffer from the extended violence inflicted by their ex-husbands, further complicating their adaptation to post-divorce life. Despite this, they still had to regulate their emotions and try to ensure their children felt their fathers' presence, a mechanism also identified in divorcees in Willen's (2015) study.

Participants also reported a lack of parental support for various reasons. Some faced misjudgment, disrespect, and discrimination from family members, while others had weak family networks and poor financial resources. In some cases, parents interfered with the women's decisions regarding divorce and child custody. Divorced women typically seek refuge in their families of origin for support during the legal process (Yohannes, 2015). So, being unwelcomed in such a context adds significant stress, particularly when trying to escape harmful conflicts. However, some participants did report receiving good parental support and reliable child maintenance. Related studies show that divorced women often rely on child maintenance and support from family and significant others (Setiamanah, *et al.*, 2021; Yohannes, 2015). Those with lower levels of perceived family support are at higher risk of stress and depression (Baechel, 2007; Greeff and van Der Merwe, 2004).

Ecological Level Risk Factors

Resilience is a dynamic process shaped by the interplay of personal, familial, and contextual protective mechanisms (Condly, 2006; Masten, 2018; Ungar, 2011). At-risk individuals are expected to seek support, while their social environments must provide resources to facilitate positive adaptation (Ungar, 2011). Vulnerability increases when environmental resources are limited, and individuals lack the competence to navigate and negotiate challenges (Condly, 2006).

In this study, participants identified challenges with the justice system, gender-biased elderly mediation, and social stigma as major ecological risk factors. The justice system, including police and courts, was a frequent point of contact for legal protection and divorce proceedings. Participants expressed concerns about inefficiencies and perceived gender biases in the system. They described the process as costly and stressful, with delays in receiving maintenance payments worsening their financial struggles. However, some participants praised justice system personnel for being cooperative and understanding (e.g., P1, P4).

Similarly, elderly mediation – locally known as ‘Shimgelna’ or ‘Jaarsumma’ was highlighted both positively and negatively. This customary dispute resolution system run by community elders, operates parallel to constitutional courts and is respected for its accessibility, efficiency, and alignment with local values (Tihut and Satterfield, 2010; Mekuanint, 2015). Elders involved are often regarded as wise, fair, honest, and knowledgeable about customary laws (Million, 2021). Four of the current participants benefited from elderly mediation, securing property shares that the courts had denied due to a lack of evidence. However, two participants reported experiencing biased decisions, raising concerns about the system’s fairness. The participants noted that while male elders may approach disputes from socio-cultural perspectives, they often failed to empathize with women’s specific challenges. The lack of women’s representation within the institution was a recurring concern.

Some previous local studies conducted in different parts of Ethiopia have also revealed that elderly mediation is not without limitations. Mekuanint (2015) who conducted a qualitative study on women as agents and subjects of the elderly mediation – ‘Shimgelna’, in Meket District, of North Wollo Zone in Ethiopia, identified that women seeking solution from ‘Shimgelna’ rarely participate as mediators, but as petitioners or offenders, in person or through male representatives. Exclusion of women from traditional conflict resolution is also a key finding in a study by

Million (2021) in the Benishangul Gumuz regional state of Ethiopia. Similarly, a study conducted on women’s access to formal and informal legal protections, in Zeghie Peninsula rural area of northwestern Ethiopia, by Tihut, and Satterfield (2010) disclosed that both the legal and the customary institutions were largely disparaging to single mothers struggling to secure their rights to own rural land. In particular, the researchers described the elderly mediation – Shimgelna to be part of the traditional “logics whereby elders expect women to “compromise” their rights in the spirit of harmony and the peaceful resolution of disputes” (p 172). According to these researchers, the elders attempt to make peace at the expense of imposing the women to compromise their rights to justice. The researchers further explained that women who resist such practice risk isolation from social networks and support systems. In the current study, two participants shared similar experiences, reporting that elders pressured them to preserve their marriages by tolerating the violent behaviors of their ex-husbands.

These findings underscore the dual nature of elderly mediation. While it offers valuable, and accessible alternatives to formal legal processes, its impact on women and their exclusion from decision-making roles warrants further investigation. Enhanced representation of women within these institutions and a reevaluation of practices that compromise justice for the sake of harmony are critical areas for improvement.

Finally, community attitude toward divorce and divorced women was a significant challenge reported by the current participants. They described being socially humiliated, discriminated against, and viewed as having bad influences on young girls and married women in their communities. The participants chose to remain single, fearing potential harm to their children from a stepfather; yet, they faced sexual harassment and stigmatization. More troubling was, the stigma extended to their custodial children, who were labeled as “fatherless” or “children of women” (P8 interview, January 2023). This caused deep pain for the mothers, who worried about the

emotional impact on their children when facing such discrimination among peers.

Despite the growing rate of divorce making it among the common social phenomena, this study highlights the persistent cultural stigma faced by divorced women, consistent with prior research (Yohannes, 2015). Culture, as part of the macro-system, strongly influences responses to adversity, with subgroups like women or custodial mothers facing unique stressors. Divorced women are at higher risk of sexual harassment, and custodial mothers often struggle to provide for their children. Similarly, Afomia's (2015) study on divorced custodial fathers in Addis Ababa revealed challenges such as lack of family support, social discrimination, and severe financial strain, emphasizing the need to address post-divorce issues for custodial parents.

The stigma highlighted here calls for community awareness to normalize divorce and foster acceptance of divorcees. Education is a key factor as poor educational backgrounds significantly limited participants' opportunities. While Ethiopia has advanced gender equality in education and politics (Parkes *et al.*, 2017), social and structural barriers still hinder women's post-divorce adaptation. The interaction of individual, familial, and societal risks heightens vulnerability, reduces resilience, and jeopardizes survival and growth amid adversity (Bonanno, 2012).

The findings of this study align and differ with several existing works, despite contextual variances. Participants reported facing multifaceted post-divorce risks, which significantly impacted their lives. The study echoes Nataraja's (2014) research on first-generation Indian American divorced single mothers, where participants in both studies reported finding peace and freedom in post-divorce, compared to their previously violent marriages. However, while Nataraja's participants generally enjoyed economic stability post-divorce, the current participants experienced socioeconomic upheaval, reflecting the importance of education and economic independence for women divorcees. The current study also resonates with findings

from Ko and Kim (2015), and Willen (2015), though it extends beyond their focus on social and emotional impacts to identify more intricate risk factors. Locally, the results align with studies by Yohannes (2015) and Dereje (2014), which highlighted the psychosocial and economic challenges faced by divorced women. However, this study uniquely uncovers the compounded effects of child custody, a dimension less explored in previous research. The child custody sophisticated the participants' vulnerability, demanding significant personal sacrifices to ensure their children's well-being, on one hand, and make them put more efforts in positive adaptation offering them purpose for living, on the other hand.

Conclusion

This study concludes that divorced custodial single mothers perceive divorce as a potentially traumatic event, with complex risk factors threatening their functionality, survival, and future development. These risks are deeply rooted in the long-standing structural disadvantages women face in patriarchal societies.

The findings highlight the high vulnerability of these mothers and emphasize the need to assess and promote protective factors that empower them to navigate post-divorce challenges effectively. The study offers valuable insights for policymakers and social welfare agencies to address the unique socioeconomic needs of divorced custodial women in contexts similar to the study area.

Implications

Resilience involves the interaction between adverse life risks and protective factors that mitigate their effects, requiring stronger safeguards as risks increase. The risk factors identified in this study are multidimensional, necessitating interventions at multiple levels.

Divorced women should be capacitated to leverage personal strengths and community resources. The government must prioritize

gender mainstreaming in education and services, implementing family-based development programs to empower custodial single mothers, and support their vulnerable children. Families and communities should provide understanding and support, while media, policy advocates, and welfare practitioners must collaborate to ensure fairness, implementation of social protections, and raise awareness about divorce and its implications.

Finally, social institutions like elderly mediation are instrumental for community based interventions. However, gender equality has been a question. So, the issue of women representation in social institutions on their matters warrants further research

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Declaration of conflict of interest

The authors declare that there is no potential conflict of interest with respect to the research, authorship, and/or publication of this article.

Research Ethics

The current study had gone through ethical review process at School of Social Work, College of Social Sciences, at Addis Ababa University

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Implicative Ideal of a Pseudoring

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Abstract

In this study, we present the notion of an implicative ideal of a pseudoring and characterize it. We also introduce the notion of a finite product property of a subset of a pseudoring and prove its relations with the implicative and other types of ideal of a pseudoring. Moreover, we demonstrate the relationship between an implicative ideal with prime, polar ideals, as well as the atom of an atomic pseudoring. Finally, we prove that a prime ideal is implicative if and only if it is a maximal ideal of R .

Keywords: Finite product property, Implicative ideal of a pseudoring, Maximal ideal of a pseudoring, Prime ideal of a pseudoring.

Introduction

Implicative algebras offer a strong and flexible tool for grasping the fundamentals of logic and computation by establishing a common framework for different model constructs, for example, Miquel (2020) make it possible to simulate intuitionistic and classical logic while obfuscating the distinction between types and proofs. Rasiowa (1974) demonstrated how different kinds of implicative algebras can be represented by more tangible structures, such as Boolean algebras or their generalizations by proving representation theorems regarding these algebras. Chadja and Langer (2007) utilized, especially to non-classical logics and associated algebraic structures, to examine the algebraic features of the implication connective. Similarly, an implicative ideal has applications in fuzzy logic. Thus, the following results were some of the studies done in different algebras by the scholars.

In the theory of MV-algebras, implicative ideals were studied by different authors, for instance, Hoo and Sessa (1994) explored the

features of implicative ideals and made linkages between them and other sorts of ideals, including prime ideals and maximal ideals, in order to apply the idea of implicative ideals to their work on MV-algebras, particularly in the setting of pseudo MV-algebras. Hoo (1997) investigated implicative ideals in MV-algebras, emphasizing their characteristics and linkages to other kinds of ideals, as well as how they relate to linearly ordered ideals, essential ideals, and maximal ideals. Hoo (1989) examined implicative ideals in relation to MV-algebras, particularly how they are used to describe and categorize various MV-algebra types. Also it was studied in the theory of BL-algebra by Walendziak (2024).

Bandaru and Shum (2014) studied the idea of implicative ideals and the fuzzy implicative ideals of a distributive implication groupoid. A finite union property of non-empty subsets of MV-algebra was introduced by Saidi and Borzooei (2020). Chajda and L'anger (2004) also introduced pseudoring. Natei *et al.* (2023) studied ideals, extended and metric ideals of a pseudoring, and introduced the polar ideal and

atom of a pseudoring. However, as far as the knowledge of the researcher goes, the implicative ideal of a pseudoring and the finite product property of a nonempty subset of a pseudoring are not yet studied. In this paper, the authors introduce an implicative ideal and establish the necessary and sufficient requirements for an ideal of a pseudoring to be characterized as implicative. Also, investigate the finite product property of a subset of a pseudoring and prove its relations with the implicative ideal. Moreover, the researcher demonstrates the relationship between an implicative ideal and prime, polar ideals, as well as the atom of an atomic pseudoring. Finally, the researchers prove that a prime ideal is implicative if and only if it is a maximal ideal of R . Throughout this paper; R denotes a pseudoring, if not otherwise stated.

Chajda and Langer (2004) stated that, an algebra $R = (R, +, \cdot, 1)$ of type $(2,2,0)$ satisfying $(R, \cdot, 1)$ is commutative monoid, the property.

$$1 + (1 + x) = x, x0 = 0, (1 + x(1 + y))(1 + y) = (1 + y(1 + x))(1 + x)$$

and

$$1 + (1 + x(1 + y))(1 + y(1 + x)) = x + y$$

holds true is called a pseudoring, where 0 denotes the element $1 + 1$.

Remark 1.1. Following from the definition of R , it is clear that $+$ is commutative.

“ $x \leq y$ if and only if $x(y + 1) = 0$.” (Chajda and Langar, 2004).

Definition 1.1. “A subset I of R containing zero that satisfies the property, for $x, y \in I, 1 + (x + 1)(y + 1) \in I$ and for any $y \in I$ and $x \in R$, if $x \leq y$ then $x \in I$ is called an ideal of R ” (Natei *et al.*, 2023).

Proposition 1.1. “A subset I of R , which contain zero is an ideal if and only if for $x, y \in I \Rightarrow 1 + (x + 1)(y + 1) \in I$ and the last property of an ideal in the Definition 1.1 is replaced by the property,

$$(y + 1)x, y \in I \Rightarrow x \in I$$
 (Natei *et al.*, 2023).

Proposition 1.2. “For any $x, y \in R, y(1 + (x + 1)y) = x(1 + (y + 1)x)$ (Natei *et al.*, 2023).

Definition 1.2. “A homomorphism is a mapping $\varphi : R_1 \rightarrow R_2$ which preserves the multiplicative identity and homomorphism with respect to both binary operations” (Natei *et al.*, 2023).

Proposition 1.3. If R is a pseudoring, then the properties $x(x + 1) = 0, y(1 + 0) = y, \forall y \in R,$ and $x + 0 = x, Char(R) = 0$ hold on R (Natei *et al.*, 2025).

Proposition 1.4. The relation \leq preserves multiplication on R and $x \leq y \Rightarrow y + 1 \leq x + 1$ (Natei *et al.*, 2025)

Definition 1.3. For any $a \in R$, define $a/I = \{x \in R : x + a \in I\}$ and for any $a, b \in R, a/I = b/I$ if and only if $a + b \in I$, where I is an ideal of R (Natei *et al.*, 2025).

Notation: $a/I = \bar{a}$.

Theorem 1.1. “The set $R/I = \{x/I : x \in R\}$ with the operations $x/I + y/I = (x + y)/I = \{r \in R : r + (x + y) \in I\}, x/I \cdot y/I = (x \cdot y)/I$ is a pseudoring for any ideal I of R ” (Natei *et al.*, 2025).

Proposition 1.5. The map $\varphi_I : R \rightarrow R/I$ by $\varphi_I(x) = x/I$ is an onto homomorphism, where I is an ideal of R .

Definition 1.4. “A proper ideal P of R is called prime ideal if for every $x, y \in R$, either $x(y + 1) \in P$ or $y(x + 1) \in P$ ” (Natei *et al.*, 2023).

“The intersection of any family of ideals of R is an ideal. Let H be a subset of R . Then the intersection of all ideals $I \supseteq H$ is the smallest

ideal containing H and is denoted by $\langle H \rangle$ (Natei *et al.*, 2025).

Definition 1.5. The ideal generated by the set of all nil potent elements of R is called nil-radical of R , and denoted by $N = \langle Nil(R) \rangle$.

Definition 1.6. “Let M be a proper ideal of R , then M is called maximal if and only if $x \in M$ or $x + 1 \in M$ but not both for every $x \in R$ ” (Natei *et al.*, 2023).

Definition 1.7 “Let X be a non-empty subset of R . Then the set $X^\perp = \{y \in R : y(1 + (x + 1)y) = 0, \forall x \in X\}$ is called a polar of X in R ” (Natei *et al.*, 2025).

Definition 1.8. “A non-zero element h of R is called an atom if:

$$(h + 1)x = 0, \text{ then either } x = 0 \text{ or } x = h” \text{ (Natei } et al., 2025).$$

Theorem 1.2. “An atomic pseudoring R contains an atom $h \in M$ such that $h^\perp = M$ for any maximal ideal M of R ” (Natei *et al.*, 2025).

Theorem 1.3. “Let X is a non-empty subset of R . X^\perp is an ideal of R ” (Natei *et al.*, 2025).

Theorem 1.4. “If $X \subseteq R$, then the following are true.

- i. If $X \cap X^\perp \neq \emptyset$, then $X \cap X^\perp = \{0\}$.
- ii. $X \subseteq X^{\perp\perp}$ ” (Natei *et al.*, 2025).

Proposition 1.6. “For every non-zero ideal I of R , I^\perp is a proper subset of R ” (Natei *et al.*, 2025).?”

Implicative Ideals

Proposition 2.1. Let $\varphi : R_1 \rightarrow R_2$ is a pseudoring epimorphism. If I be an ideal of R_1 and $ker(\varphi) \subseteq I$, then $\varphi(I)$ is an ideal of R_2 .

Proof. Let $x \in R_2$ and $y \in \varphi(I)$ with

$x \leq y$. Since φ is onto $\exists a, b \in R_1$ such that $\varphi(a) = x$, $\varphi(b) = y \Rightarrow (y + 1)x = 0 \Rightarrow \varphi(a)(\varphi(b) + 1) = \varphi(0) = 0 \Rightarrow \varphi(a(b + 1)) = 0 \Rightarrow a(b + 1) \in ker(\varphi) \subseteq I \Rightarrow$ by Proposition 1.1, $a \in I$.

Lemma 2.1. Let H be a subset of R . The set $\langle H \rangle$ has following properties: If $H = \emptyset$, then $\langle H \rangle = \{0\}$. If $H \neq \emptyset$, then $\langle H \rangle = \{x \in R \mid 1 + \prod_{i=1}^n (h_i + 1)\}$ for some $h_i \in H$ and $n \in \mathbb{N}$.

Proof. Let H be a subset of R . If $H = \emptyset$, $I = \{0\}$ is clearly the smallest ideal that contains H . Let $H \neq \emptyset$ and let $T = \{x \in R : x \leq 1 + \prod_{i=1}^n (h_i + 1)\}$ for some $h_i \in H$.

We want to show that T is an ideal of R containing H . Let $a \in H$ we know that $a \leq a = 1 + (1 + a) \Rightarrow a \in T \Rightarrow H \subseteq T$.

(i) Clearly $0 \in T$.

(ii) Let $x, y \in T \Rightarrow x \leq 1 + \prod_{i=1}^n (h_i + 1)$ for some $h_i \in H$, and $i = 1, 2, \dots, n$ and $y \leq 1 + \prod_{j=1}^m (k_j + 1)$ for some $k_j \in H$. Let $h = 1 + \prod_{i=1}^n (h_i + 1)$ and $k = 1 + \prod_{j=1}^m (k_j + 1)$. It follows that $x \leq h$ and $y \leq k$. By Proposition 1.4, $h + 1 \leq x + 1$ and $k + 1 \leq y + 1 \Rightarrow (h + 1)(k + 1) \leq (x + 1)(k + 1) \leq (x + 1)(y + 1) \Rightarrow 1 + (x + 1)(y + 1) \leq 1 + (h + 1)(k + 1)$.

Replacing h, k with their respective values

$$1 + (x + 1)(y + 1) \leq 1 + (\prod_{i=1}^n (h_i + 1) (\prod_{j=1}^m (k_j + 1))) \Rightarrow 1 + (x + 1)(y + 1) \in T.$$

(iii) Let $x \leq y, y \in T \Rightarrow y \leq 1 + \prod_{i=1}^n (h_i + 1)$ for some $h_i \in H$

$$\Rightarrow x \leq 1 + (h_1 + 1)(h_2 + 1) \cdots (h_n + 1) \Rightarrow x \in T$$

Therefore T is an ideal of R containing H . Let $x \in T \Rightarrow x \leq 1 + \prod_{i=1}^n (h_i + 1)$ for some $h_i \in H$. Assume that $n = 2$, then $x \leq 1 + \prod_{i=1}^2 (h_i + 1) \in \langle H \rangle$. Because $h_1, h_2 \in H \subseteq \langle H \rangle$ and $\langle H \rangle$ is an ideal. This implies $x \in \langle H \rangle$.

The same is true for any $n \in N$. Therefore, $T \subseteq \langle H \rangle$. Since $\langle H \rangle$ is the smallest ideal containing H , implies $T = \langle H \rangle$.

Definition 2.1. Let I represent R 's ideal. Then, I is referred to as an implicative ideal if any $x, y, z \in R$ with $x \cdot y \cdot z \in I$ and $x(y + 1) \in I \Rightarrow xz \in I$.

Theorem 2.1. Let I be an ideal of R . Then the following statements are equivalent.

- i. I is implicative.
- ii. For $x \in R$, with $x^n \in I \Rightarrow x \in I$ for $n \geq 1$.
- iii. For $x, y \in R$, with $x \cdot y^2 \in I \Rightarrow xy \in I$
- iv. For $x, y, z \in R$ with $x \cdot y \cdot (z + 1) \in I$ and $zx \in I \Rightarrow xy \in I$.

Proof. (i \Rightarrow ii) Suppose I is an implicative ideal of R . Let $x^n \in I \Rightarrow x \in I$. If $n = 1$, it is obvious. If $n = 2$, then $x^2 = x \cdot x \cdot 1 \in I$ and since I is an ideal, $x(x + 1) = 0 \in I$. Thus by Definition 2.1, $x \cdot 1 = x \in I$. Consider $x^n = x^{n-2} \cdot x \cdot x \in I$ and $x^{n-2} \cdot (x + 1) = 0 \in I$ for $n > 2$. Thus by Definition 2.1, $x^{n-2} \cdot x = x^{n-1} \in I$. Now again $x^{n-1} = x^{n-3} \cdot x \cdot x \in I$ and $x^{n-3} \cdot (x + 1) = 0 \in I$. Thus by Definition 2.1, $x^{n-2} \in I$. Continuing in this manner we find that $x^2 \in I$.

(ii \Rightarrow iii.) Suppose (ii) holds. Let $xy^2 \in I$. Since $x^2y^2 \leq xy^2 \in I \Rightarrow (xy)^2 \in I$. By

(ii) it follows that $xy \in I$.

(iii \Rightarrow iv). Suppose (iii) holds. Let $x \cdot y \cdot (z + 1) \in I$ and $zx \in I \Rightarrow x \cdot y \cdot t \in I$ and $(t + 1)x \in I$ for some $t = z + 1$. Since $x \leq 1 + (x(t + 1) + 1)(t + 1)$ because $x(x(t + 1) + 1)(t + 1) = (t(x + 1) + 1)((x + 1)x = 0$ by P_6.

Thus by Proposition 2.4, we have $x^2y \leq xy(1 + (x(t + 1) + 1)(t + 1))$. Since $t = z + 1$, consider

$$xy(1 + (x(t + 1) + 1)(t + 1))(xyt + 1)(x(t + 1) + 1) = xy(1 + (xz + 1)z)(xy(z + 1) + 1)(xz + 1).$$

By P_2 we have $xy(1 + (xz + 1)z)(xy(z + 1) + 1)(xz + 1) = xy(xz + 1)(1 + (xz + 1)z)(xy(z + 1) + 1)$.

By P_1, P_6 and P_2 , we have $xy(xz + 1)(1 + (xz + 1)z)(xy(z + 1) + 1) = xy(z + 1)(1 + (z + 1)xz)(xy(z + 1) + 1) = xy(z + 1)(xy(z + 1) + 1)(1 + (z + 1)xz) = 0$.

Hence,

$$yx^2 \leq xy \cdot (1 + (x(t + 1) + 1)(t + 1)) \leq 1 + (xyt + 1)(x(t + 1) + 1).$$

Thus by (iii) $xy \in I$.

(iv \Rightarrow i) is straight forward.

Corollary 2.1. Let I be an ideal of R . If I is implicative ideal, then $Nil(R) \subseteq I$ where $Nil(R)$ is set of all nil-potent elements of R .

Proposition 2.2. If $IM(R)$ is set of all implicative ideals of R , then a nil-radical

$$N \subseteq \bigcap_{I \in IM(R)} I.$$

Proof. Clearly $\bigcap_{I \in IM(R)} I$ is an implicative

ideal of R . It follows $Nil(R) \subseteq \bigcap_{I \in IM(R)} I$.

Thus, by Definition 1.5, $N \subseteq \bigcap_{I \in \text{IM}(R)} I$.

Theorem 2.2. Let I be an ideal of R . Then the following statements are equivalent.

1. I is implicative.
2. $\{x \in R : x^2 = 0\} \subseteq I$.
3. For all $x \in R, x(1 + x^2) \in I$.

Proof. (1 \Rightarrow 2). Let $y \in \{x \in R : x^2 = 0\} \Rightarrow y^2 = 0 \in I \Rightarrow 1 \cdot y^2 \in I$.

From proposition 2.1 (iii), we have $1 \cdot y = y \in I$.

(2 \Rightarrow 3). Let $x \in R$, consider $(x(1 + x^2))^2 = x^2(1 + x^2) \cdot (1 + x^2) = 0$. By (2) it follows that $x(1 + x^2) \in I, \forall x \in R$.

(3 \Rightarrow 1). Let $xy^2 \in I$. Since $x^2y^2 \leq xy^2 \in I \Rightarrow (xy)^2 \in I$. By (3) it follows that $xy(1 + (xy)^2) \in I$ and from Proposition 1.2, we have $xy \in I$. Therefore by Proposition 2.1, I is implicative.

Corollary 2.2. Let I be an implicative ideal of R and J be any ideal of R . If $I \subseteq J$, then J is an implicative ideal of R .

Corollary 2.3. If R has only zero as its nilpotent element, then $I = \{0\}$ is an implicative ideal of R .

Remark 2.1. If $K = \{x \in R : x^2 = 0\}$ is an ideal, then K is implicative.

Theorem 2.3. Let I be an ideal of R . I is a prime and an implicative ideal if and only if either $x \in I$ or $x + 1 \in I$.

Proof. Let $x \in R$. Since I is implicative by Proposition 2.2, $x(1 + ((x + 1) + 1)x) = x(1 + x^2) \in I$. As I is a prime ideal either $x((x + 1) + 1) = x^2 \in I$ or

$(x + 1)^2 \in I$. If $x^2 \in I$, from Theorem 2.1, we have $x \in I$. If $(x + 1)^2 \in I \Rightarrow x + 1 \in I$. Conversely suppose either $x \in I$ or $x + 1 \in I$ for any $x \in R$. Since I is an ideal and $x(1 + x^2) \leq x, x + 1 \Rightarrow x(1 + x^2) \in I$. By Theorem 2.2, I is implicative. Let $x, y \in R$. Since $x(y + 1) \leq x$ and $y(x + 1) \leq x + 1$, by assumption either $x(y + 1) \in I$ or $y(x + 1) \in I$. Thus I is prime.

Corollary 2.4. P is prime and implicative if and only if P is a maximal ideal.

Proof. According to Theorem 1.2, a proper ideal P of R is a maximal ideal if and only if, for every element x in R , either x is in P or $x + 1$ is in P . Therefore, by Theorem 2.3, we can deduce that P is both prime and implicative.

Proposition 2.3. Let I be the proper implicative ideal of R . Then I is prime if and only if I is the maximal ideal.

Proof. The forward proof follows from Corollary 2.4 and the converse proof is straightforward.

Theorem 2.4. For every P which is both an implicative and a prime ideal of R , there exists an atom h in the atomic pseudoring R such that $P = h^\perp$.

Proof. Let P be both an implicative and a prime ideal. By Corollary 2.4 and Theorem 1.2, the theorem holds.

Note that every ideal that is an implicative and prime ideal of a pseudoring is polar.

Proposition 2.4. Let $\varphi : R_1 \rightarrow R_2$ be a surjective homomorphism of a pseudoring. If I is an implicative ideal of R_1 and $\ker(\varphi) \subseteq I$, then $\varphi(I)$ is an implicative ideal of R_2 .

Proof. Let I be implicative ideal of R_1 and $\ker(\varphi) \subseteq I$. By Proposition 2.1, $\varphi(I)$ is an ideal of R_2 . Let $x, y, z \in R_2$ with $x \cdot y \cdot z \in \varphi(I)$ and $x(y + 1) \in \varphi(I)$. Since φ surjective there exists $a, b, c \in R_1$ such that $\varphi(a) = x, \varphi(b) = y, \varphi(c) = z, \Rightarrow \varphi(abc) \in \varphi(I)$ and $\varphi(a(b + 1)) \in \varphi(I) \Rightarrow abc \in I$ and $a(b + 1) \in I$. Since I is implicative $ac \in I \Rightarrow xz \in \varphi(I)$.

Proposition 2.5. If R is a Boolean ring, then each ideal I of R is implicative.

Proof. Let $xyz \in I$ with $x(y + 1) \in I$, for I is an ideal of R . It is clear that $xz(y + 1) \leq x(y + 1)$. By Definition 1.1 $xz(y + 1) \in I$. Since R is Boolean ring and by Proposition 1.1, $xz(1 + xz(y + 1)) = xyz \in I \Rightarrow xz \in I$. Therefore I is implicative.

Proposition 2.6. In Proposition 1.5, if I is an implicative ideal of R , then the kernel of φ_I or $(\ker(\varphi_I))$ is an implicative ideal of R .

Proof. Let $xyz \in \ker(\varphi_I)$ and $x(y + 1) \in \ker(\varphi_I) \Rightarrow \varphi_I(xyz) = \bar{0}$ and $\varphi_I(x(y + 1)) = \bar{0} \Rightarrow xyz \in I$ and $x(y + 1) \in I \Rightarrow xz \in I \Rightarrow xz \in \ker(\varphi_I)$.

Definition 2.2. Let $H \subseteq R$ is said to have the finite product property if $1 + (h_1 + 1)(h_2 + 1) \cdots (h_n + 1) \neq 1$ for any $h_1, \dots, h_n \in H$ and $h_i \neq 1$, for $1 \leq i \leq n$

Example 2.1. Let $R = \{0, a, b, 1\}$ be a set. R and the operations '+' and '.' is defined as:

+	0	a	b	1	.	0	a	b	1
0	0	a	b	1	0	0	0	0	0
a	a	0	1	b	a	0	a	0	a
b	b	1	0	a	b	0	0	b	b
1	1	b	a	0	1	0	a	b	1

Since we can easily see that $R = (R, +, \cdot, 1)$ is a pseudoring, $H = \{0, a\}$ has a finite product property, but $J = \{0, a, b\}$ has no finite product property because $1 + (a + 1)(b + 1) = 1$.

Example 2.2. Every singleton set different from the set containing unity in the Boolean ring has a finite product property.

Theorem 2.5. Let $H \subseteq R$ and $1 \notin H$. Then $\langle H \rangle$ is a proper ideal of R if and only if H has the finite product property.

Proof. Let $\langle H \rangle$ be a proper ideal of R . And assume that H has no finite product property. Then there are some of the elements in H , i.e. there exist $h_1, \dots, h_n \in H$ such that $1 + \prod_{i=1}^n (h_i + 1) = 1$ by Lemma 2.1, $1 \in \langle H \rangle$. Hence $\langle H \rangle = R$ implies contradiction to $\langle H \rangle$ is proper ideal of R .

Conversely, Suppose H has a finite product property. Assume that $\langle H \rangle = R \Rightarrow 1 \in \langle H \rangle$ by Lemma 2.1, $1 \leq 1 + \prod_{i=1}^n (h_i + 1)$ for some $h_i \in H$ which is a contradiction to H having a finite product property.

Proposition 2.7. Let $x \neq 1$ be in R and I be an ideal of R such that I has the finite product property. If $x \in I$ and $x + 1 \notin I$, then $I \cup \{x\}$ has the finite product property.

Proof. Let $B = I \cup \{x\}$. We need to show that $1 + (b_1 + 1)(b_2 + 1) \cdots (b_n + 1) \neq 1$ for any $b_1, b_2, \dots, b_n \in B$ and $b_i \neq 1$.

Assume $1 + (b_1 + 1)(b_2 + 1) \cdots (b_n + 1) = 1$

for some $b_1, b_2, \dots, b_n \in B$. If $b_1, b_2, \dots, b_n \in I$, then it is clear that by Definition 1.1, $1 \in I$. This contradicts the fact that I has finite product property.

Without loss of generality let $b_1 = x$ and $1 + (b_1 + 1)(b_2 + 1) \dots (b_n + 1) = 1$

for some $b_1, b_2, \dots, b_n \in B \Rightarrow 1 + (x + 1)((1 + (b_2 + 1)(b_3 + 1) \dots (b_n + 1)) + 1) = 1 + (x + 1)(b_2 + 1)(b_3 + 1) \dots (b_n + 1) = 1$

implies $(x + 1)(b_2 + 1)(b_3 + 1) \dots (b_n + 1) = 0 \in I$.

Since $1 + (b_2 + 1)(b_3 + 1) \dots (b_n + 1) \in I$ by Proposition 1.1, we have $x + 1 \in I$ which is a contradiction. Therefore in both case $1 + (b_1 + 1)(b_2 + 1)(b_3 + 1) \dots (b_n + 1) \neq 1$

for any $b_1, b_2, \dots, b_n \in B$. and so $I \cup \{x\}$ has the finite product property.

Proposition 2.8. Let $\varphi : R_1 \rightarrow R_2$ be a homomorphism, then the following holds;

- i. If $H \subseteq R_1$ has a finite product property and φ is one to one, then $\varphi(H)$ has a finite product property.
- ii. If $H \subseteq R_2$ has a finite product property and φ is onto, then $\varphi^{-1}(H)$ has a finite product property.

Proof

i. Let $t_1, t_2, \dots, t_n \in \varphi(H)$ such that $(t_1 + 1)(t_2 + 1) \dots (t_n + 1) = 0$. It follows that there are $h_1, h_2, \dots, h_n \in H$ such that $\varphi(h_1) = t_1, \varphi(h_2) = t_2, \dots, \varphi(h_n) = t_n \Rightarrow \varphi((h_1 + 1)(h_2 + 1) \dots (h_n + 1)) = 0 \Rightarrow (h_1 + 1)(h_2 + 1) \dots (h_n + 1) \in \ker(\varphi) = \{0\}$. This is a contradiction. Hence $\varphi(H)$ has a finite product property.

ii. Assume that there exists $t_1, t_2, \dots, t_n \in \varphi^{-1}(H)$ with $(t_1 + 1)(t_2 + 1) \dots (t_n + 1) = 0 \Rightarrow \varphi(h_1 + 1)(h_2 + 1) \dots (h_n + 1) = 0$ for some $h_i \in H$ and $\varphi(h_i) = t_i$. This is a contradiction that H has finite product property.

Proposition 2.9. Let $At(R)$ be the set of all atoms in R . Then $At(R)$ has a finite product property.

Proof. Assume there exist $h_i \in At(R)$, for $i = 1, 2, \dots, n$ and for each $h_i \neq 1$ with $1 + (h_1 + 1)(h_2 + 1) \dots (h_n + 1) = 1 \Rightarrow (h_1 + 1)(h_2 + 1) \dots (h_n + 1) = 0$

By Definition 4.1.1, either $(h_2 + 1) \dots (h_n + 1) = h_1$ or $(h_2 + 1) \dots (h_n + 1) = 0$.

Case 1: If $(h_2 + 1) \dots (h_n + 1) = h_1$, then $h_1 (h_2 + 1) \dots (h_n + 1) = 0$

$$\Rightarrow h_1(h_3 + 1) \dots (h_n + 1) \leq h_2 \Rightarrow h_1(h_3 + 1) \dots (h_n + 1) = h_2$$

or

$h_1(h_3 + 1) \dots (h_n + 1) = 0$. If $h_1(h_3 + 1) \dots (h_n + 1) = h_2 \Rightarrow h_2 \leq h_1$. Since h_i 's are distinct, $h_2 = 0$. This contradicts that h_2 is an atom. Thus $h_1(h_3 + 1) \dots (h_n + 1) = 0$. It follows that $h_1(h_4 + 1) \dots (h_n + 1) = h_3$ or $h_1(h_4 + 1) \dots (h_n + 1) = 0$. Similarly, if $h_1(h_4 + 1) \dots (h_n + 1) = h_3 \Rightarrow h_3 = 0$ and this contradicts h_3 is an atom. Thus $h_1(h_4 + 1) \dots (h_n + 1) = 0$. Proceeding like this we get $h_1(h_n + 1) = 0 \Rightarrow h_1 = 0$. This is also contradiction. Therefore $h_1 \neq (h_2 + 1) \dots (h_n + 1)$.

Case 2: If $(h_2 + 1) \dots (h_n + 1) = 0$, then by Definition 4.1.1 and mathematical induction, $h_i = 1$ for some i . This is a contradiction.

Hence $1 + \prod_{i=1}^n (h_i + 1) \neq 1$.

Proposition 2.10. If I is a proper ideal of R , then I has a finite product property.

Proof: Assume $1 + \prod_{i=1}^n (h_i + 1) = 1$, for some elements $h_i \in I$. It follows from Definition 1.1, $1 \in I \Rightarrow I = R$ which is a contradiction.

Thus, from Corollary 2.4 and Proposition 2.10, we conclude that if I is an implicative and prime ideal of R , then I has a finite product property.

Theorem 2.6. If I is a proper implicative ideal of R , then $I^{\perp\perp}$ has a finite product property.

Proof. Let I be an implicative ideal properly contained in R . Since from Proposition 2.10, it follows that I has a finite product property and by Proposition 1.5, $I \subseteq I^{\perp\perp}$, by Proposition 1.6, we conclude that $I^{\perp\perp}$ is a properly contained in R . From Theorem 1.4, it follows that $I^{\perp\perp}$ is an ideal of R . Consequently, by Proposition 2.10, the theorem holds.

Conclusion

To summarize, an implicative ideal is a distinct sort of ideal in a pseudoring with unique qualities. Implicative ideals are also important for describing the algebraic structure of an ideal and its relationship to other types of ideals. Implicative ideal of a pseudoring, like it does in other algebraic structures, has applications in fuzzy logic. In this study, the authors define the notion of implicative ideal of a pseudoring and various theorems, propositions, corollaries, and lemmas were given, and their proofs were demonstrated. The researchers also demonstrated that every prime ideal is implicative if and only if it is a maximum ideal. Furthermore, the finite product property of a subset of a pseudoring is defined and some of its characteristics are proven. It is useful for scholars who need to investigate the structure and properties of ideals of a pseudoring in depth. The relationship between a subset of a

pseudoring with the finite product property and the implicative ideal was proved. Finally, it was shown that an implicative ideal has a relationship with prime, polar ideals, and the atom of an atomic pseudoring.

Contribution statement

The first author is the one who came up with the concept of finite product properties. He also establishes the relationship between the ideal that is generated by this subset of a pseudoring and the other sorts of ideals, particularly the implicative ideal of a pseudoring. Furthermore, all theorems and assertions are originated and proven by the first author.

The second author was the one who came up with the concept of the implicative ideal in the case of pseudoring. He also served as a guide during the entire process of writing the document, particularly with regard to the verification of all the features.

The third author provided a critical evaluation and revised the article.

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Declaration

The authors declare that the manuscript is original, has never been published, and is not currently under consideration for publication elsewhere and no data sets were generated or analyzed during the current study

Conflict of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper

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Impact of External Debt on Economic Growth: Evidence from Ethiopia Using an Autoregressive Distributed Lag model Approach

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Abstract

Debt overhang is the current Ethiopian principal challenge that creates underinvestment problem. Thus, the debt burden incurred deteriorates economic growth of the country. The main objective of the research was to examine the impact of external debt on economic growth in Ethiopia using annual data for period of 1981 to 2022 from National Bank of Ethiopia, Central Statistics Authority of Ethiopia, International Monetary Fund and the World Bank Database. The study employed Autoregressive Distributed Lag approach to analyze the impact of external debt on economic growth. The result of the study revealed that the bounds co integration test approach shows the presence of long run equilibrium relationship between the variables under consideration. In long run, the empirical growth equation revealed that external debt stock as a percentage of Gross National Income has a significant positive impact on economic growth in the long run; whereas its square has a significant negative impact with economic growth implying that there is a non-linear relationship between economic growth and external debt stock. The capital outflow (total debt service) which is needed to service external debt for country has negative impact on economic growth both in the long run and short run. However, external debt stock has a positive impact on economic growth in the long run if it is maintained at maximum level. The error correction term value which is speed of adjustment, -0.230584 is indicate that around 23% shocks happened in short run is restored (converge) to long run equilibrium per year and confirmed the existences of co-integration among the variables under consideration. Finally, the study suggested that, government instead of heavily depend on external debt for development it must mobilize domestic resources to stimulate the domestic revenue collection process to fill country financial gap. The government should also control the level capital outflow, to reduce capital outflow for debt servicing it needs a professional and skilled negotiation with international donor agencies and countries, stimulate production and promote the development of an economy. The government should adopt targeted policies such as improved foreign exchange supervision and incentives for domestic investment to effectively manage capital outflows.

Keywords: External debt, Economic growth, Capital outflow, Autoregressive distributed lag model, Co-integration, Ethiopia

Introduction

Ethiopia holds a vital role within Africa's geopolitical and economic framework. Being the continent's second-largest country by population, its substantial market potential and advantageous position in East Africa establish it as a key contributor to regional progress. Throughout the first twenty years of the 2000s, Ethiopia was commonly referenced as an exemplar of accelerated growth, maintaining robust yearly economic expansion from 2000 through 2020. Nevertheless, this story of continuous prosperity has become more complex in recent times due to a multi-faceted crisis a concurrent series of devastating challenges that have significantly strained the nation's capacity to recover. In 2024, Ethiopia's public debt reached roughly 32 percent of its total economic output. Between 1991 and 2024, the government's borrowing relative to economic performance, referred to as the debt-to-GDP ratio, typically remained near 34.72 percent, though it peaked at 53 percent in 2021, (National Bank of Ethiopia, 2025).

Ethiopia's macroeconomic position has been increasingly strained by repeated domestic and external shocks, which have widened both fiscal and balance-of-payments gaps. In 2023, the value of merchandise imports exceeded USD 17.7 billion, while export earnings remained limited at roughly USD 3.6 billion, underscoring the depth of the country's trade imbalance and restricted budgetary capacity. A growing portion of government spending has been devoted to servicing public debt and financing security-related expenditures, thereby limiting allocations to health, education, and other social priorities (MoFED, 2024). As of December 2022, total public liabilities combining domestic and foreign debt were estimated at about USD 59.3 billion, close to half of national output. While aggregate debt ratios offer a broad snapshot of fiscal exposure, they do not fully capture repayment pressures. More sensitive indicators point to heightened risk, including a debt service-to-export ratio of

approximately 22 percent and scheduled repayments exceeding USD 7 billion between 2023 and 2025, which include a USD 1 billion Eurobond maturity due in December 2024. Reflecting these vulnerabilities, Ethiopia has been assessed as being at high risk of debt distress by international financial institutions (Deguenonvo, 2025).

Due to these weaknesses, international financial institutions have determined that Ethiopia faces a high risk of debt distress. Considering this situation, Ethiopia officially requested debt restructuring through the G20 Common Framework in early 2021. In doing so Ethiopia joined a limited number of African countries, including Ghana, Zambia and Chad, in seeking coordinated creditor action (Hart and Larvin, 2021).

However, implementation under the framework has proceeded at a sluggish pace. In December 2023, Ethiopia entered external default after informing Eurobond holders that it could not meet a USD 33 million interest payment on its USD 1 billion bond. The authorities cited acute liquidity shortages, alongside broader policy and strategic considerations, as the primary reasons for this action (Selenik, 2024).

Ethiopia can adopt a mix of internal and external policy options to end the current fiscal/financing gaps. Domestically also the augmentation of tax revenue requires fundamental changes, that are so far missing like broadening tax base, enhancing tax administration efficiency and doing away with wastage of public expenditure including those related to governance pervasiveness: corruption (Sisay, 2021). From an external perspective, the country has access to multiple debt restructuring and relief arrangements, as well as complementary financial instruments, each associated with varying advantages and operational constraints. If carefully designed and effectively implemented, these measures could create fiscal room to finance post-conflict recovery efforts, scale up social safety nets, enhance climate adaptation capacity, advance structural transformation, and contribute to

long-term stability and peace building (Ali, 2024).

The debt overhang framework argues that when public indebtedness reaches excessive levels, it can deter private investment and weaken economic performance, ultimately deepening poverty. Conversely, under sound fiscal management, borrowing can act as a catalyst for growth by financing productive investment, improving development outcomes, and increasing per capita income conditions essential for sustained poverty reduction (Spilioti and Vamvoukas, 2015). It is unclear whether Ethiopia's current debt situation matches what the debt overhang hypothesis predicts and this needs to be carefully studied with real data. Many studies have looked at how debt affects growth, but their findings have been clear and sometimes even conflicting.

In general, the effect of external debt on economic growth still a hotly debated topic in the development economics (Dogan and Sukruaglu, 2022). Many studies have looked at this connection using different methods and data analysis but they often reach very different results. While some findings point to a growth-enhancing role of external borrowing, others highlight its potential to hinder economic expansion. The absence of consistent evidence has prevented the emergence of a clear consensus, leaving the debt growth linkage unresolved and reinforcing the need for further context-specific empirical research (Chigeto, 2017; Daud, 2020).

Studies examining the connection between foreign debt and economic development have produced mainly contradictory research finding (Mahammed,2025). Certain research indicates that obtaining funds from international lenders can stimulate economic expansion, particularly when these resources are directed toward productive investments and development initiatives (Govdeli, 2019; Musibau *et al.*, 2018; Okoye *et al.*, 2017; Spilioti and Vamvoukas, 2015). Conversely, alternative studies propose that excessive foreign borrowing may hinder development by creating repayment difficulties, decreasing investment levels, and undermining economic stability (Al

Kharusi and Ada, 2018; Daud, 2020; Gachunga, 2018; Getinet and Ersumo, 2020; Moh'd Al-Tamimi and Mohammad, 2019; Senadza *et al.*, 2017). This negative view is supported by Udoh *et al.* (2020), who used a method called autoregressive distributed lag (ARDL) to show that passing on debt across generations hurts Nigeria's economic growth. Similar results were found by Awan and Qasim (2020), are researchers who conducted a practically research on the current issue and found that external debt has a clearly shown significant harmful effect on economic growth in Pakistan (Sandow, 2022).

The relationship between foreign debt commitments and economic growth patterns demonstrates a fundamentally non-linear nature. Research findings indicate that borrowing may stimulate growth only until reaching a specific limit, after which further debt accumulation proves harmful. Investigations employing this framework reveal that reasonable debt levels can facilitate growth when capital is effectively distributed, while overwhelming debt burdens create negative economic effects (Doğan and Bilgili, 2014; Égert, 2012; Reinhart and Rogoff, 2010). These contrasting results underscore persistent empirical challenges and establish compelling grounds for continued research into the ideal debt-growth dynamic.

The research timeframe was selected due to the accessibility, reliability, and comprehensive nature of data available for all model variables. The majority of information was obtained from domestic sources, including the National Bank of Ethiopia (NBE) and the Central Statistical Agency (CSA). When local sources provided insufficient or missing data, additional information was gathered from established international databases, particularly those maintained by the International Monetary Fund (IMF) and the World Bank (WB) (Canton, 2021).

Materials and Methods

Research Design

The research is rooted in a quantitative methodology framework, which proves appropriate for analyzing numerical correlations and validating economic theories through the use of secondary data sources. Through the application of econometric techniques, this approach enables comprehensive assessment of the relationship between foreign debt and economic development (Saungweme, 2020).

Sources and Types of Data

The empirical investigation utilizes yearly time-series information covering the period from 1981 to 2022, offering an adequately extended timeframe for dependable statistical conclusions. This research depends entirely on secondary information sources, encompassing over forty years of data, which strengthens the analytical foundation and allows for examining both extended-period and immediate-term relationships.

The research timeframe was chosen considering the availability, dependability, and completeness of pertinent information for all variables included in the model. Original data sources were obtained from domestic institutions, particularly the National Bank of Ethiopia (NBE) and the Central Statistical Agency (CSA). In cases where local documentation proved inadequate or unavailable, supplementary data were sourced from internationally recognized databases, including those managed by the International Monetary Fund (IMF) and the World Bank (WB) (Canton, 2021).

Econometric Model

Evaluating how external debt influences economic growth necessitates a robust theoretical foundation that connects borrowing patterns to long-term growth outcomes. Therefore, this research is based on neoclassical growth theory, which highlights capital accumulation, workforce changes, and technological advancement as the primary drivers of continuous economic development.

Following previous empirical studies (Aswata *et al.*, 2018; Hassan, 2020; Sani *et al.*, 2019), the analytical structure relies on the Cobb–Douglas production function, which is presented as follows (AS Hassan,2020):

$$Y_t = K_t^\alpha (A_t L_t)^{1-\alpha} \dots \dots \dots (1)$$

In the above specification, Y_t denotes the level of aggregate output (income) in the economy at time t . K_t represents the stock of physical capital, while L_t refers to the labor input employed in the economy at the same period. (Carlin *et al.*, 2024). The term A_t captures the level of technological progress. The parameter α measures the output elasticity with respect to capital, whereas $1 - \alpha$ reflects the output share attributable to labor, with the restriction that $0 < \alpha < 1$ (Makhubele, 2024).

Technological advancement is thought to make work easier (Harrod-neutral), meaning that effective labor is shown as AL . The production function shows that doubling all inputs will double output, which lets us talk about output per effective worker. This change makes it easier to study how productivity and growth change over time.

$$\frac{Y_t}{A_t L_t} = \frac{K_t^\alpha (A_t L_t)^{1-\alpha}}{A_t L_t} = \frac{K_t^\alpha}{(A_t L_t)^\alpha} \dots \dots \dots (2)$$

Then it becomes capital to effective labour ratio as following

$$y = k_t^\alpha \dots \dots \dots (3)$$

Furthermore, based on the foregoing discussion, output per effective unit of labor can be assumed to be constant and to evolve in accordance with the next equations (4) and (5) (Tola, 2023).

$$\frac{Y_t}{L_t} = \frac{A_t L_t^{1-\alpha}}{L_t} \dots \dots \dots (4)$$

$$y_t = A_t (k_t)^\alpha \dots \dots \dots (5)$$

By taking the natural logarithm of the above equation, it can be expressed in the following form:

$$\ln y_t = \ln A_t + \alpha \ln k_t \dots \dots \dots (6)$$

After equation 5 can be turned in to natural logarithm, as shown in equation 6, it is also can be done by adding an external debt variable into the equation and substituting it in to equation 7. The result below can be derived like this.

$$\ln y_t = \ln A_t + \alpha \ln D_t + \alpha \ln k_t \dots (7)$$

$$\ln y_t = \ln A_t + \alpha \ln D_t + \alpha \ln k_t + \varepsilon_t \dots (8)$$

In equation (8), D stands for external debt, k shows the amount of physical capital that affects how much each worker can produce, and ε_t is the error term. To check if external debt has a nonlinear impact on economic growth, we can change the equation to include the squared term of D (Tola, 2023). This helps in understanding if there are certain points where the effect of debt changes or if its impact decreases over time.

$$\ln y_t = \ln A_t + \alpha \ln D_t + (\alpha \ln D_t)^2 + \alpha \ln k_t + u_t (9)$$

In this case u_t is a stand for a new error term for the equation (Tola, 2020).

Model Specification

Based on the theory, a framework for studying growth is created to look at how outside debt affects the economy. The model uses a real GDP per person as a main thing being measured and includes several macroeconomic factors, like external debt, as things that explain the changes. Adding a lagged version of the main variable helps the model understand how growth continues and changes over time.

$$\ln y_t = \ln A_t + \alpha \ln D_t + (\alpha \ln D_t)^2 + (EXD_{it})^2 + \alpha \ln k_t + u_t (10)$$

Within this framework, the variable t represents time, while the annual real GDP per capita for

country i during period t is indicated. The delayed dependent variable reflects the starting GDP per capita level. The independent variable EXD corresponds to the nation's complete external debt stock. Additionally, the external debt squared component is included in the framework to investigate whether a nonlinear association exists between external debt and economic development in Ethiopia throughout the research timeframe (AS Hassan, 2020; Dawood *et al.*, 2024; D'Andrea, 2022; Hassan and Mayer, 2021).

Where t is time t Y_t represent the GDPP for a country equivalent to GDPP i at time t annually. Whereas, Y_{t-1} represent the initial GPDPP or the first lag of the dependent variable. The explanatory variable EXD represents a total external debt stock for the country. In addition, $(EXD_{it})^2$ the squared of this variable in a model will be used to test for the existence of nonlinear relation between external debt and economic growth for Ethiopia under the study (Tola, 2023).

All variables are transformed into natural logarithms, which facilitates interpreting the coefficients as elasticity and helps mitigate potential heteroskedasticity. The resulting empirical model, designed to test the debt overhang hypothesis, is specified as follows:

$$\ln GDPP_t = \alpha + \beta_1 \ln EXD + \beta_2 (\ln EXD)^2 + \beta_3 \ln DSERV + \beta_4 \ln GCF + \beta_5 \ln TOT + \beta_5 \ln EXR + \beta_6 \ln INF + \varepsilon_t \dots (11)$$

Where,

- GDPP t = GDP at time t
- EXD = Stock of external debt to GNI ratio
- DSERV = Debt servicing
- GCF = Gross capita formation
- TOT = Terms of trade (captures external shocks)
- EXR = Exchange rate
- INF = Inflation rate

In the above model the parameters $\beta_1 \dots \beta_6$ is representing the coefficient of elasticity's measures (Tsigereda, 2017).

Variable definitions and priori expectation **Method of Estimation**

The definition of variables and measurement methods adhere to conventional standards established in research on economic growth and debt. All metrics are calculated annually to maintain consistency across different time periods and facilitate the examination of trends. The anticipated direction of coefficient values is based on established economic theory and results from prior empirical studies.

Autoregressive Distributed Lag (ARDL) bounds testing method created by Pesaran *et al.* (2001) was used in this study to look at both long-term balance connections and short-term changes between the variables. The ARDL method is good for this because it works with variables that have different levels of integration, like I(0) or I(1), and it works well even with small data sets (Sarawar, 2023) (Table 1).

Table 1. Description and measurement of variables

No notations	Description	Expected sign	Measurement	Sources
<i>Dependent variable</i>				
1. GDP	Per capita GDP		annual %	NBE
<i>Independent variables</i>				
2. EXD	External debt stock	Mixed	% GDP	IMF &WB
3. TD	Term of Trade	Positive	ratio of GDP	WB
4. GCF	Gross capital formation		Annual %	WB
	Positive			
6. ER	Exchange rate	Positive	Annual %	NBE
7. INF	Inflation rate	Negative	Annual %	NBE
8. DSERV	Debt services	Negative	Annual %	WB

Source: Author’s description, 2023. NBE: National Bank of Ethiopia, IMF: International Monetary Fund, WB: World Bank.

The presence of co-integration among the variables is evaluated using the ARDL bounds testing procedure, whereas short-run dynamics are analyzed via an Error Correction Model (ECM) derived from the estimated ARDL framework. The inclusion of lagged terms for both the dependent and explanatory variables enables the model to capture dynamic relationships and the speed at which deviations from long-run equilibrium are corrected (Gafsi, 2025).

$$\Delta GDP_t = \beta_0 + \beta_1 EXD + \beta_2 EXD^2 + \beta_2 DSERV + \beta_2 GCF + \beta_2 TOT + \beta_2 EXR + \beta_2 INF + ECT_{t-1} \dots (12)$$

The best number of lags is chosen first by using a basic Vector Autoregressive (VAR) model and the Akaike Information Criterion (AIC). Once the right number of lags is found.

An unrestricted Error Correction Model (ECM) is then used to show both the short-term change and how quickly the variables actually return to their long-term balance obtained (Fernandez *et al.*, 2020; Ubesue, 2016).

$$\begin{aligned} \Delta GDP_t = & \beta_0 + \sum_{i=0}^p \beta_1 \Delta GDP_{t-i} - 1 + \sum_{i=0}^p \beta_2 \Delta EXD_t + \sum_{i=0}^p \beta_3 \Delta EXD_t^2 + \sum_{i=0}^p \beta_4 \\ & \Delta DSERV_t + \sum_{i=0}^p \beta_5 \Delta GCF_t + \sum_{i=0}^p \beta_6 \Delta TOT_t + \sum_{i=0}^p \beta_7 EXR_t + \sum_{i=0}^p \beta_8 \\ & \Delta INF_t + \beta_9 GDP_t - 1 + \beta_{10} EXD_t + \beta_{11} EXD_t^2 + \beta_{12} DSERV_t \\ & + \beta_{13} GCF_t + \beta_{14} TOT_t + \beta_{15} EXR_t + \beta_{16} INF_t + ECT_t - 1 \dots (13) \end{aligned}$$

The error correction term (ECT) is the defined in the following equation (Jama, 2021) as: stated as follows:

$$\begin{aligned}
 ECT_t - 1 = & \Delta GDP_t - \beta_0 \\
 & - \sum_{i=0}^p \beta_1 \Delta GDP_{t-i} - \sum_{i=0}^p \beta_2 \Delta EXD_t - \sum_{i=0}^p \beta_3 \Delta EXD^2 - \sum_{i=0}^p \beta_4 \\
 & \Delta DSERV_t - \sum_{i=0}^p \beta_5 \Delta GCF_t - \sum_{i=0}^p \beta_6 \Delta TOT_t - \sum_{i=0}^p \beta_7 EXR_t - \sum_{i=0}^p \beta_8 \\
 & \Delta INF_t + ECT_t - 1 \dots (14)
 \end{aligned}$$

Results and Discussions

Descriptive Analysis

The descriptive statistics demonstrate significant fluctuations in Ethiopia's economic outcomes during the research timeframe from 1981 to 2022. Real GDP per capita expanded at a mean rate of roughly 5.6 percent, with the weakest growth figures recorded during the mid-1980s and the strongest performance noted in more recent periods (Sukadi, 2020). The comparatively restrained standard deviation indicates that while economic expansion varied across different periods, it consistently stayed within established parameters.

Furthermore, the country's external debt remains high, averaging 58.92 percent of its Gross National Income from 1981 to 2022 as clearly shown below in figure 1. As a result, during this time period, the country has been

accumulating more debt, with the debt burden increasing from a minimum of 10.5 to a maximum of 147.1 percent (Anosike, 2024). This justifies that financial gaps in the country are more highly supplemented by foreign borrowing to bridge up gaps during financial constraints.

Trend Analysis of Economic Growth and Variables of Interest

The gross domestic per-capita of the country was sharply declined in 1993 from 293.35 to 176.46 in 1994 and was on a stable trend up to 2004. This result aligns with Khuliso, 2023. The economic performance of the country was begun to behave continuously over the time starting from 2004 to 2020. However, the trends of external debt significantly fluctuate over time between 1980's-2005. The level of debt stock as a percentage of GNI was larger in the last two decades for the country than the total debt stock in 2015 to 2022 over the passage of time. Generally, the trend of level debt stock as a percentage of GNI was stable beyond 2006 onwards for the country (Getinet and Ersumo, 2020).

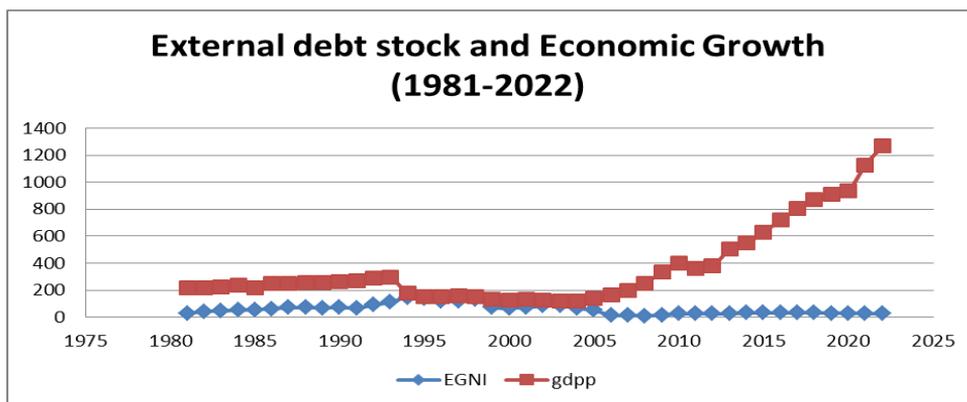


Figure 1. Trend of external debt stock and Economic growth

Source: Author's computation using NBE and WB database for EGNI and GDP per-capita respectively, 2023.

Fig. 2 below illustrates the relationship between total debt service and GDP per capita (GDPP) over the study period. The trend shows that total debt service has generally increased at a

relatively steady pace, while the mean GDPP exhibited a gradual upward trajectory until 1997, after which it declined. From 2004 onward, GDP per capita experienced a sharp rise, significantly diverging from its previous

trend, before moderating in 2011. In contrast, the debt service trend remained relatively stable, displaying fewer pronounced fluctuations over the same period.

There was slightly small change in debt service in country. This indicate that the country is not totally service all of his debt burden with stated time this created the problem debt accumulation over the passage of time. The GDPP of the country was increasing slowly over the time between the ranges of 1981 to

1993 then after there was down turns in economic growth in the country (Makuria, 2013). After 1990 the economic performance of the country improving over time up to 1998 before becoming to down turns and continuously curb up over time from 2000 a head. This fluctuation in economic performance over time in a country is might be due to policy changes, drought in the region and political instability the country encountered during Ethio-Eritrea war from 1998-2000.

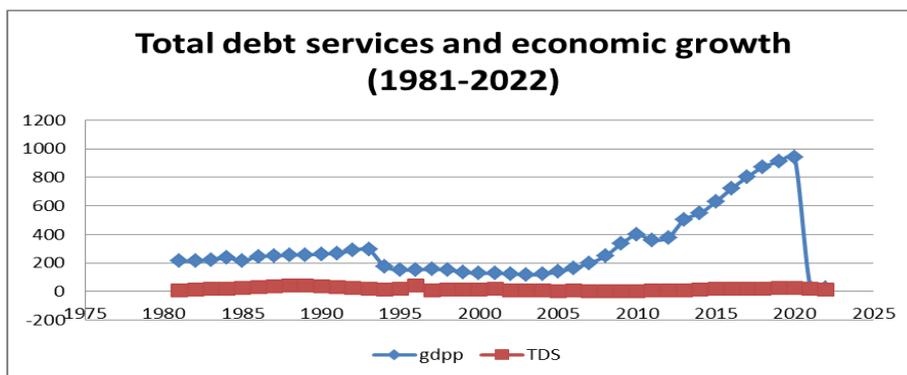


Figure 1. Total debt service data against GDPP values over the study period
 Source: Own computation using NBE and WB database for TDS and GDP per-capita respectively, 2023.

Model Diagnostic Test

The ARDL model in this study passes through all standard econometric validity and robustness tests. Hence, the tests are presented as follows.

Unit root test

To verify the reliability of the time-series examination, the stationary characteristics of all

variables were assessed through the Augmented Dickey–Fuller (ADF) test (Abdirashid, 2017). The findings reveal that the majority of variables display non-stationary behavior in their original forms but achieve stationarity following first-order differencing, whereas the inflation rate demonstrates stationary properties at its original level across multiple model configurations (Kholera and Sin, 2023).

Table 2. Stationarity tests for the study variables.

		Stationarity I(0)						
		Lngdpp	Lngcf	Inf	Egni	Egni ²	Rer	Tds
With	cst	0.2830	2.0152	-5.5986	-1.4773	-1.7135	-1.9688	-2.0577
and trend		(0.9744)	(0.9998)	(0.000*)	(0.5344)	(0.4168)	(0.2988)	(0.2622)
With		-0.5936	-1.3549	-5.9677	-2.2348	-2.1532	-2.1227	-2.2792
constant		(0.9738)	(0.8585)	(0.0001*)	(0.4580)	(0.5012)	(0.5175)	(0.4348)
Without cst		1.2930	3.2483	-4.1750	-0.7310	-1.2879	-0.3772	-0.6355
and trend		(0.9478)	(0.9995)	(0.000*)	(0.3934)	(0.1791)	(0.5419)	(0.4355)
		Stationarity I(1)						
With	cst	-3.7906	-7.1834	-16.6174	-5.757		-5.875	-7.857
and trend		(0.0064*)	(0.0000*)	(0.0000*)	(0.0000*)		(0.0000*)	(0.0000*)
With		-4.0771	-9.3382	-16.2601	-5.718		-7.602	-9.084
constant		(0.0142**)	(0.0000*)	(0.0000*)	(0.0002*)		(0.0000*)	(0.0000*)
Without cst		-3.6375	-5.9428	-15.5083	-5.820		-5.963	-7.985
and trend		(0.0006*)	(0.0000*)	(0.0000*)	(0.0000*)		(0.0000*)	(0.0000*)

Source: Author computation using Eviews 10, 2023. *, ** and *** indicate statistically significant at 10%, 5% and 1 % probability level, respectively (Tadele, 2015).

The findings from unit root testing across three different model specifications are displayed in Table 2. These findings reveal that when examined in their level form, all variables exhibit non-stationary behavior with the exception of the inflation rate. The majority of series demonstrate probability values that surpass the 5 percent significance threshold, confirming the existence of unit roots (IMF, 2020), whereas the inflation rate achieves stationarity only following first differencing. Upon applying these tests to the first-differenced series, all other variables attain stationarity, indicating that the majority of variables follow an integration of order one, I(1), while certain variables maintain integration of order zero, I(0) (Sekwati, 2025).

The simultaneous presence of I(0) and I(1) variables suggests the potential for a long-term equilibrium relationship to exist among these series. For this purpose, the Autoregressive Distributed Lag (ARDL) methodology introduced by Pesaran *et al.* (2001) proves especially appropriate, as it allows for the estimation of co-integration relationships between variables having mixed integration orders through ordinary least squares. The ARDL model framework establishes the dependent variable as a function of its previous lagged values alongside both current and lagged values of the independent variables, utilizing an optimally determined lag structure.

Multicollinearity Test

Table 3. Correlation analysis

	lnGDPP	Lngcf	Inf	Rer	Egni	Tds
Lngdpp	1.0000					
Lngcf	0.5776	1.0000				
Inf	0.0075	0.2588	1.0000			
Rer	0.3915	-0.1564	0.2018	1.0000		
Egni	-0.0615	-0.6652	-0.4038	-0.0110	1.0000	
Tds	0.4619	-0.2135	-0.2151	0.6198	0.3115	1.0000

Source: Author computation using Eviews 10, 2023

Correlation results indicate that GDP per capita is moderately related to the majority of the

explanatory variables (see Table 3). External debt stock is negatively correlated with economic growth, whereas capital formation

and debt service display positive relationships. Notably, all correlation coefficients remain below commonly accepted multi-collinearity thresholds, suggesting that the estimated parameters are not adversely affected by strong linear relationships among the regressors.

information criteria. Although the Schwarz and Hannan–Quinn criteria suggested a more parsimonious lag order, the Akaike Information Criterion (AIC) which is more reliable in small-sample contexts identified two lags as optimal. Accordingly, this lag specification was employed in the subsequent ARDL estimations.

Model Lag selection criterion

Table 4 indicates that the selection of the optimal lag length was based on several

optimal. Consequently, this lag structure was adopted for subsequent ARDL estimations.

Table 4. Table Optimal Lag Length Selection Criteria

Lag	LagL	LR	FPE	AIC	SC	HQ
0	-1150.890	NA	4.26e+16	60.99419	61.33894	61.11685
1	-918.5137	354.6789	6.50e+12	52.13230	55.23510*	53.23625*
2	-837.7472	89.26834*	4.31e+12*	51.24985*	57.11068	53.33509

Source: Author computation using Eviews 10, 2023 *, ** and *** indicate statistically significant at 10%, 5% and 1 % probability level, respectively (Tadele, 2015). LR: Lag Ratio, NA: Not Applicable, FPE: Final Prediction Error, AIC: Akaike Information Criterion, SC: Schwartz-Bayesian Information Criterion, HC: Hannan-Quinn Information Criterion (Tola, 2023).

ARDL Model Bounds Co-integration Test Result

The results from the ARDL bounds test (Table 5) show strong evidence of a long-term balance or connection between the variables (Boakye *et al.*, 2022). According to Sana, 2018, the F-statistics from the ARDL model is higher than the upper critical value at common significance

levels, which means the result shows we can reject the idea that there is no long-term link (Nicosia, 2022). Overall, the result confirms that both the long-term and short-term behaviors in the model can be accurately estimated.

Table 1. Bound test result

F-Bounds Test Test Statistic	Value	Null Hypothesis: No levels relationship		
		Signif.	I(0) Asymptotic: n=1000	I(1)
F-statistic	6.137309	10%	2.03	3.13
K	7	5%	2.32	3.50
		2.5%	2.60	3.84
		1%	2.96	4.26

Source: Author computation, 2023.

As indicated by the F-statistics in Table 5, the F-value of 6.13 exceeds the upper bound values at all levels of significance. This result align with Shinwari *et al.* (2024). This necessitates the rejection of the null hypothesis, which posits no relationship between the variables, in

favor of the alternative hypothesis. This finding strongly suggests the presence of a co-integrating relationship among the variables. Consequently, both long-run and short-run models can be reliably estimated. The subsequent table presents the estimated

parameters for the long-run equation of the model.

Empirical analysis of impact of external debt on economic growth of Ethiopia

Long run ARDL-Result Estimation

The ARDL model was applied with real GDP per capita (GDPP) as the dependent variable to represent economic growth (Nguyen, 2019). The explanatory variables included gross capital formation (GCF), inflation (INF), external debt to GNI (EGNI) along with its squared term (EGNI²), trade openness (TD), the real exchange rate (RER), and debt service (TDS) by Kibona and kirame (2024), Adamu (2017). The Akaike Information Criterion (AIC) was used to determine the optimal lag length, which was found to be two lags for both the dependent variable and all the regressors.

The long-term outcome demonstrates that the extent of external debt is positive and

significant on GDP growth is at the 5 % level, and this has not been possible for other works to discover. Parsers on economic growth with the 5% level of significance level as shown by the model (Ebin, 2020). However, when we look at the squared term of external debt, there is a negative and significant effect at the same level (Hassan, 2020). This shows that the real debt and the economic performance of a state ship between external debt and economy and growth (Abdirashid, 2017).

Before reaching the turning point, an increase in external debt is linked to an average yearly growth of about 4.09%. This means that, in the long run, using external debt in a moderate way can boost private investment by creating positive effects that encourage production in the private sector. In such cases, the benefits from investments funded by debt are enough to cover the costs of repaying the debt. These findings match earlier studies by Chigeto (2017) and Hassan (2020).

Table 6. ARDL long run Estimation Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNGCF	0.256712	0.110424	2.324783	0.0327
EGNI	0.040976	0.014964	-2.738257	0.0140
EGNI ²	-0.000219	8.36E-05	2.620193	0.0179
TD	0.045769	0.024256	1.886931	0.0764
INF	-0.011174	0.011139	-1.003146	0.3299
RER	0.009119	0.003773	2.417254	0.0272
TDS	-0.038752	0.016984	2.281643	0.0357

Source: Author computation using Eviews 10, 2023.

In table 6, LNGCF stands for Long-run Gross Capital Formation, IMF represents inflation rate, EGNI is External debt as a percentage of GNI, RER EGNI² is External debt stock squared, TD is Term of Trade, and TDS stands for Total Debt Service(Hassan,2020). All these terms are used to describe different economic indicators over time.

The impact of Control Variables on Economic Growth in long run

Gross capital formation is a strong factor that helps drive long-term growth, showing how important investment is for increasing productive capacity. Debt service payments have a clear negative impact, which means paying off debt takes away resources that could be used for spending that helps the economy grow (Duru *et al.*, 2023).

The long-term results show that paying off debt has a strong negative effect on economic growth, and this effect is statistically significant

at the 5% level, which matches what theory predicts. In numbers, if debt payments increase by one percentage point, economic growth is expected to drop by about 3.8%, assuming other things stay the same. This finding strongly supports the ideas that having too much debt can be harmful and that paying it off takes away money that could be used for things that help the economy grow, especially in areas like building infrastructure. Furthermore, this result corroborates existing empirical findings, including those of Yusuf and Mohd (2021) for Nigeria and Nagou *et al.* (2021) for selected African countries, both of which report a pronounced long-run growth-reducing effect of debt service burdens.

The term of trade is the ratio of a country's export prices to its import prices. When the term of trade gets better, it can help increase economic growth (NESDC, 2024). This means that when a country gets better terms of trade (Nguyen, 2023), it can charge more for what it sells and pay less for what it buys. Long-term estimates show that the term of trade has a positive effect on Ethiopia's economy (Awadzia *et al.*, 2025; Sinta and Moraref, 2024). Specifically, a 1% increase in the term of trade is expected to raise economic growth by 4.5% each year, and this effect is significant at the 1% level, assuming other factors stay the same (Ali-mohamed *et al.*, 2025).

Moreover, the estimated long-run elasticity of the real exchange rate shows a positive and statistically significant relationship with economic growth at the 5% significance level.

Specifically, a 1% increase in real exchange rate undervaluation is linked to about a 0.9% increase in economic growth per year, all else being equal (Kamphasa, 2021). This suggests that keeping a relatively competitive real exchange rate can help improve growth by supporting export performance and domestic production. This result is consistent with the findings from Rapetti (2020), who found that real exchange rate dynamics have a positive impact on economic growth in developing countries (Hellen, 2020).

Short run impact of external debt on economic growth in Ethiopia

The short-run dynamics were studied using an Error Correction Model (ECM). The estimated error correction term is negative, statistically significant, and less than one in absolute value, showing that the system adjusts steadily toward the long-run equilibrium. The coefficient of -0.230584 means that about 23% of any short-term deviation from the long-run growth path is corrected within a year (Ajufo, 2025). This suggests a reasonably quick adjustment speed, where shocks to economic growth in one period are partially reduced in the next. The significance of the error correction term confirms there is a real long-run relationship between the variables, with short-term imbalances slowly moving toward balance at an annual rate of roughly 23% (Awadzia *et al.*, 2025; Bosupeng, 2019; Madhu and Giri, 2024).

Table 7. ARDL short-run estimated results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.169789	0.017729	9.576920	0.0000
D(EGNI)	0.004445	0.001893	-2.348230	0.0312
D(EGNI(-1))**	0.007302	0.001965	3.715002	0.0017
D(EGNI (-2))	-2.35E-05	1.04E-05	2.250829	0.0379
D(EGNI2(-1))**	-3.74E-05	9.58E-06	-3.905451	0.0011
D(TD)	0.004770	0.002295	2.078129	0.0532
D(TD(-1))***	-0.010373	0.002076	-4.996470	0.0001
D(INF)	-0.001912	0.000692	-2.764769	0.0133
D(INF(-1))	-0.001257	0.000713	-1.762814	0.0959
D(RER)	0.000861	0.000345	2.495895	0.0231
D(RER(-1))*	0.001265	0.000395	3.206931	0.0052
D(TDS)	0.003207	0.001311	2.446338	0.0256
D(TDS(-1))	-0.003225	0.001497	-2.154503	0.0458
ECM(-1)***	-0.230584	0.027696	-8.325592	0.0000

Source: Model Output (2023) NB: *, ** and *** indicate statistically significant at 10%, 5% and 1 % probability level, respectively. Debt stock (D) for each variables in the model of the study.

As shown in Table 7, the current level of external debt, known as EGNI, has a positive and significant effect on economic growth at the 5% level, matching the long-term results. If everything else stays the same, a one-percentage-point rise in external debt is linked to about a 0.4% rise in real GDP growth. Also, the external debt from one period earlier, EGNI(-1), has a positive and significant impact on current economic growth. This shows that some level of borrowing from abroad can help boost short-term economic growth (Okeke and Udenwa, 2025).

At the same time, the short-term effects of external debt are also statistically significant but have different signs, which fit with the long-term non-linear model. This suggests that external borrowing has two sides for Ethiopia's growth: at reasonable levels, it helps growth by making it easier to get money, but too much debt can lead to problems or create adverse effects that weaken growth performance. Overall, these results provide additional support for the existence of a non-linear debt-growth relationship, confirming that beyond a

certain threshold, external debt becomes detrimental to economic activity (WB, 2011).

Post estimation diagnostics tests

After estimating a model, it's important to run some tests to make sure the results are reliable. In dynamic models, the usual tests that are done include checking are done include checking for normality, autocorrelation, heteroscedasticity, model specification, and stability. These tests help ensure that the regression results from the model are not due to chance or incorrect assumptions, of diagnostic and that they are trustworthy.

Ramsey RESET test checks if the model is correctly set up or if there are any missing variables. The test statistics looks at how well the relationship between the main outcome and other factors is shaped. The result shows a RESET test p-value of 0.64, which is much higher than the usual significance level, even the 10% one (Hellen, 2020). This means there are no missing variables in the model. The autocorrelation test shows that the model isn't affected by serial correlation. The Breusch

-Godfrey Lagrangian Multiplier test result also doesn't provide enough evidence to say the lagged values in the model autocorrelation in the residuals at the 5% significant level (NEPT, 2024).

Table 8. Ramsey RESET Test

	Value	Df	Probability
t-statistic	0.473905	16	0.6420
F-statistic	0.224586	(1, 16)	0.6420

Source: Author computation using Eviews 10, 2023

The Ramsey RESET test was used to check if there are any important variables missing from the model and to see if the model as a whole is correctly specified. The test starts by assuming that the model is properly specified, and this assumption is considered true if the p-value is higher than the chosen significance level. In this case, the RESET test gave a p-value of 0.64, which is much higher than the usual significance levels of 10%, 5%, and 1%. This means we cannot reject the idea that the model is correctly specified, so it doesn't seem to have any important variables missing that could affect the results (Table 8).

Table 2. Breusch-Godfrey Serial Correlation LM Test

F-statistic	1.685798	Prob. F(2,15)	0.2186
Obs*R-squared	6.973843	Prob. Chi-Square(2)	0.0306

Source: Author computation using Eviews 10, 2023

Heteroscedasticity Test

Heteroscedasticity happens when the spread of the error terms is not the same across all observations of the study, meaning the residuals vary in how far they are from the average line over time. Even though heteroscedasticity doesn't make the ordinary least squares (OLS) estimates wrong or biased, it makes them less efficient because they don't have the

Testing for autocorrelation is important because if it exists, the results from the OLS method might not be accurate or efficient, and this could lead to incorrect estimates of the beta values in the regression model. It's important to check for this issue. The autocorrelation test shows that the model does not have serial correlation. The commonly used Breusch-Godfrey test also supports this conclusion, as it does not reject the idea that there is no autocorrelation in the residuals at the 5% significance level.

Autocorrelation Test

Testing this model is important because significantly if there is autocorrelation, the estimates from the OLS method are not efficient and unbiased. This can lead to underestimating the beta values in the popular regression model. It's important to check if the model has this issue. The autocorrelation test shows that the model does not have serial correlation. The most widely used Breusch-Godfrey test also does not reject the idea that there is no autocorrelation in the residuals at the 5% significance level.

don't have the smallest possible variance (Wooldridge, 2013). The prominent Breusch-Pagan-Godfrey test in Table 10 shows that both the F-statistical probability (0.86) and the Chi-square probability (0.74) are higher than the 5% significance level (Table 10). This means we can't reject the idea that we actually learn from this the error terms have constant variance, so we conclude that the error spread is consistent and evenly around the average line.

Table 3. Heteroscedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.592519	Prob. F(20,17)	0.8689
Obs*R-squared	15.60862	Prob. Chi-Square(20)	0.7406
Scaled explained SS	2.887024	Prob. Chi-Square(20)	1.0000

Source: Author computation using Eviews 10, 2023.

Normality Test

After the model was estimated, several checks were done to make sure it was strong and dependable. First, the Ramsey RESET test was used to check if the model was set up correctly. The result had a p-value of 0.64, which means we can't say for sure that the model is missing important variables. Next, the Jarque–Bera test checked if the leftover numbers from the model followed a normal pattern. The test gave a JB value of 0.605 and a p-value of 0.73 (Fig. 3), showing the leftovers are normally spread out

(Makuria, 2013). Then, tests for patterns over time and changing error sizes didn't find any problems. Finally, the CUSUM and CUSUMSQ tests checked if the model's key numbers stayed stable over time, and both stayed within expected limits (Mahmood, 2013). All these tests together show the model meets the main rules for good regression analysis, making the findings trustworthy and accurate.

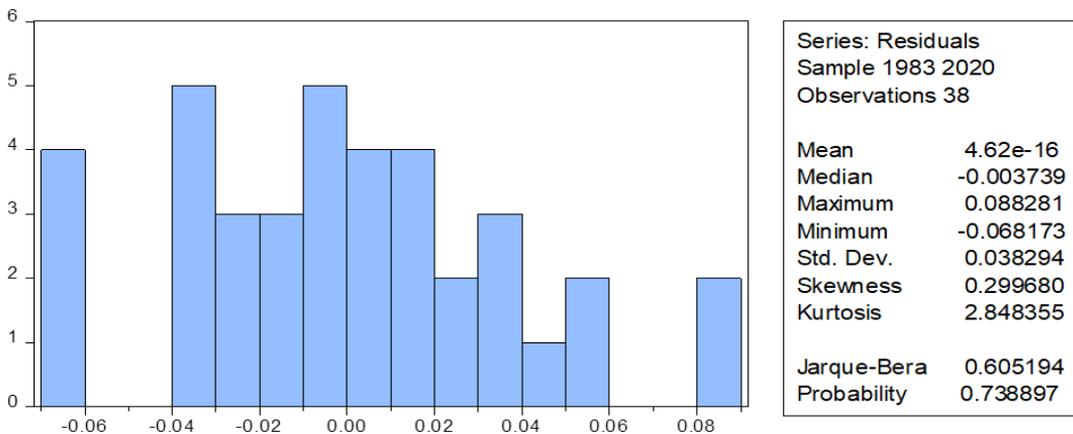


Figure 2. Normality Test: Jarque-Bera (JB) probability.

Source: Author computation using Eviews 10, 2023

Stability Test (Structural Breaks in Model)

In econometric analysis, structural break means an unexpected change in the model's parameters over time. This significantly can make the model less reliable, lead to big forecasting mistakes, and make the study results less trustworthy. To check if the existence of the also the relationships found in the study are strong and reliable, there this research used two tests the cumulative sum are of recursive residuals (CUSUM) of recursive residuals (CUSUM) and final cumulative sum of squared recursive residuals (CUSUMSQ) (Tola, 2023).

Checking for stability is important to make sure the short term and long-term connections found in the model analysis empirically of the

study stay the same throughout the whole time period. These tests, based on the method by Brown *et al.* (1975), use residuals calculated step by step and don't need us to know where to know where breaks might happen, unlike the Chow test. The CUSUM test looks at the total the total of the recursive residuals, certainly while CUSUMSQ does the same but with the squared values of the result, the residuals. If the plotted results stay within the plotted result 5% significance level lines, we can't reject the idea can't reject the idea that the parameters are stable. However, if they cross those lines, it means there's a structural change observed, and we reject the idea of stability.

Figure 4 shows that the model result indicate the CUSUM plot stays within the value 5% significant lines (marked 5% by two red lines) At the same level of significance, were the

CUSUMSQ test gives similar results, supporting the idea that the model is stable (Makhubele, 2024). We accept the idea that the parameters are stable and evenly spread out. Our model passed all the tests for diagnosis and stability. The straight lines in the chart show the 5% significance level.

(Boakye *et al.*, 2022; Selenik, 2024). At the 5% significance level, both tests shows consistent results, meaning the parameters are stable and evenly distributed. This shows the model meets all the necessary conditions necessary conditions for diagnosis and stability ,with the straight lines in the charts of the study representing the 5% critical limits.

The model's stability was checked using the CUSUM and CUSUMQ tests to make the study results more believable

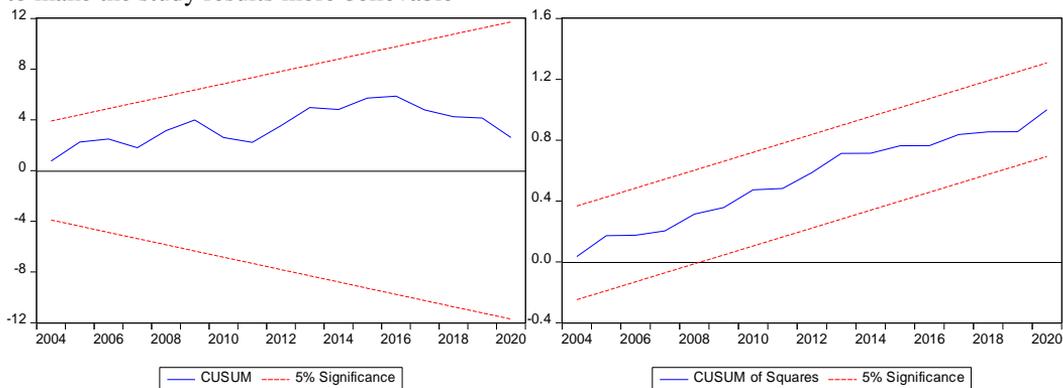


Figure 4. Stability Test: Structural Breaks in Model
Source: Author computation using Eviews 10, 2023

Conclusions

This study looks at how external debt has affected Ethiopia's economic growth over 40 years, from 1981 to 2022, using time series data. The reason for this study is because Ethiopia has often depended on borrowing from outside to cover its yearly budget needs at different times. During this time, the country has heavily relied on money coming in flowing from foreign sources to fill in the gaps in its domestic finances. This makes Ethiopia one of the most indebted countries in the East Africa region. The high level of dependence on foreign funds shows that domestic financial resources are limited and that domestic saving are low. Because of this, borrowing has been seen as important for dealing with the most country's twin deficit problems and for helping to keep the economy growing.

al debt and economic growth in Ethiopia. The results from the ARDL co-integration ARDL showed that there is a long-term connection between the variables used in the study.

The estimation results reveal that external debt exerts a nonlinear effect on Ethiopia's economic growth over the study period, operating in both the short and long run. At moderate levels, external debt contributes positively to economic growth by supporting investment and productive capacity. However, once debt exceeds a critical threshold, its impact becomes negative, reflecting rising debt-servicing burdens and macroeconomic inefficiencies. This evidence confirms the presence of an inverted U-shaped relationship between external debt and economic growth, indicating that while sustainable debt accumulation can foster economic expansion, excessive external indebtedness constrains growth performance.

To do this, the study mostly used an ARDL co-integration method to explain the long-term strong relationship between the variables. It also used an ECM to understand the short-term changes in the relationship between extern

Recommendation and Policy Implications

Drawing on the study's findings, targeted policy measures are recommended to help the government and policymakers manage external debt and its implications for economic growth. The results demonstrate a nonlinear relationship between external debt and economic performance in both the short and long run. While moderate levels of external debt contribute positively to growth, excessive accumulation exerts a significant adverse effect, underscoring the need for prudent debt management strategies.

Therefore, the sound policy implications following this finding suggested for the government. The government should work hard to cut down its heavy reliance on foreign loans and use the money borrowed from outside in ways that help the country grow and develop. By doing this, the government can make more money and be better able to pay back its debts. This helps create a sustainable debt situation that supports strong economic growth, removes the negative effects of debt, and brings in more investments. To support both sustainability and growth, the government must manage debt-related projects carefully so that they bring in income and allow timely repayment of the loan payments. Also, the money borrowed from abroad should not be used for everyday expenses, paying off old loans, or for projects that don't create value. Instead, it should be directed towards long-term projects that can boost the country's manufacturing sector and increase its growth rate.

Rather than relying heavily on external debt to finance development, the government could prioritize mobilizing domestic resources to strengthen revenue collection and address the country's financial gaps. This can be achieved by implementing innovative strategies to expand the tax base, reform tax administration, and minimize tax evasion and avoidance. Simultaneously, external debt should be allocated efficiently to support poverty reduction, address infrastructure deficits, stimulate production, and promote overall economic development. Proper allocation can

foster inclusive growth while mitigating the negative impact of external debt on economic performance. Additionally, the government should manage capital outflows strategically, including debt servicing, through skilled negotiations with international donors and creditor countries.

According to the study, the government and those who make policy decisions should take clear steps to manage external debt and its impact on the economy. The results show that the relationship between external debt and how the economy is doing isn't always clear. It can change depending on the time. At a moderate level, external debt can help the economy grow, but if it gets too big, it can slow down growth. This shows how important it is to handle debt carefully to prevent issues.

Therefore, the government should carefully reduce its reliance on external debt and use borrowed funds in ways that help development and create value. By doing this, the government can earn more income and better manage its ability to pay back debts. This approach helps maintain a sustainable level of external debt, which supports economic growth and removes negative effects of debt, making the country more attractive to investors.

To make sure that growth and sustainability go hand in hand, the government must manage debt-based projects well so that they can generate income and repay debts on time. Also, borrowed funds should not be used for everyday expenses, paying back old loans, or projects that do not help the economy. Instead, these funds should properly be directed toward long-term investments, which can help increase the growth rate of the manufacturing sector.

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Declaration of conflict of interest

The author declare that there is no competing interest.

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