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RESEARCH ARTICLE

Magnitude of Uncontrolled Blood Pressure and Associated Factors among Adult Hypertensive Patients Attending at Medical Referral Clinic of Hawassa University Comprehensive Specialized Hospital, Sidama Regional State of Ethiopia, 2021

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Abstract

Background: Hypertension is a global public health problem. Uncontrolled blood pressure adds to the burden of cardiovascular diseases (CVDs), stroke, and renal failure caused to early mortality and disability. Good control of blood pressure (BP) is vital to prevent the complications mentioned above. However, the blood pressure control rate in adult hypertensive patients is poor, and the reasons for poor BP control are not fully understood globally.

Objective: The main aim of the study was to determining the magnitude of uncontrolled blood Pressure (BP) and related factors among adult hypertensive patients attending the cardiovascular clinic of Hawassa University Comprehensive Specialized Hospital, southern Ethiopia, 2021.

Methods: An institution-based cross-sectional study design was conducted from July to September 2021 on 227 adult hypertensive patients attending the cardiovascular clinic of Hawassa University Comprehensive Hospital. Data was collected using a close ended questionnaire through head-on interviews and secondary data chart review. Data was entered and examined using Statistical Package for the Social Sciences (SPSS) version 22 software. A logistic regression model (p-value of ≤ 0.05 and adjusted odds ratio with a 95% confidence interval) was used to measure the strength of the association.

Result: Among the overall participants, 147 (64.8%) were men. The mean age of the participants was 51.4 ± 12 years. The magnitude of uncontrolled hypertension (UHTN) was found 57.3%. Over-weight (AOR = 7.526, 95% CI: 2.932, 19.317), lack of health education (AOR =3.3, 95% CI: 0.137, 8.03), not adhering to anti-hypertensive medication (AOR = 5.588, 95% CI: 1.160, 26.918), not adhering to physical activity (AOR =2.619, 95% CI: 1.089, 6.300) and use of top added salt (AOR = 2.6, 95% CI: 1.019, 6.707) were associated factors with UHTN.

Conclusion: The magnitude of UHTN is high. Patients' adherence to anti-hypertensive medication, physical workout, and weight reduction can significantly reduce the risk of hypertension. Salt reduction and health education are also vital.

Keywords: Associated factors, Blood pressure control, Cross-Sectional Study

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Background

Hypertension (HTN), also known as high or raised blood pressure (BP), is one of the leading causes of the global burden of disease [1]. It is usually an asymptomatic and chronic disorder needing lifelong treatment [2,3]. It is defined as when a Person's systolic blood pressure (SBP) in the office or clinic is ≥140 mm Hg and/or their diastolic blood pressure (DBP) is ≥90 mm Hg following repeated examinations [1,4]. There are about one billion individuals affected by hypertension in the globe. Nearly all counties & races of the globe are affected. It is known as uncontrolled if SBP is ≥140 mm Hg and/or DBP ≥90 mm Hg in patients taking anti-hypertensive medications [4].

Uncontrolled hypertension is the major public health problem among hypertensive patients in developed and developing countries [5,6]. Despite the availability of effective medical therapeutic interventions for hypertension with proven benefits in reducing cardiovascular morbidity and mortality, more than half of the hypertensive patients on treatment have blood pressures above 140/90 mm Hg threshold. [7-9]. Worldwide, hypertension is not adequately controlled, and control is worse in lower-income countries [10]. In 2010, control of hypertension was estimated to be 28% in high-income and 8% in middle- and low-income countries [11].

Most studies in Africa showed that less than a third of patients achieve treatment goals [12]. A meta-analysis also showed that in most of Sub-Saharan Africa (SSA), the control of BP to the target level (140/90) is less than 30% [13]. Few studies conducted in Ethiopia revealed that the prevalence of uncontrolled hypertension among patients on treatment varied from 11.4% in Gondar University Hospital to 59.9% in Tikur Anbessa Hospital and 69.9% in Zewditu Memorial Hospital [14-16].

Systolic Blood Pressure Intervention Trial (SPRINT) reported intensive versus standard BP control (systolic BP of <120 vs. <140 mm Hg) in adults with hypertension results in a 25% risk reduction in major cardiovascular events and a 27% reduction in all-cause mortality [17]. However, when hypertension (HTN) remains uninhibited, risks for long-term consequence such as myocardial infarction, heart failure, stroke, and kidney disease are significantly increased. For every 20 mm Hg increase in systolic BP to >115 mm Hg or 10 mm Hg increase in diastolic BP to >75 mm Hg, the risk of major cardiovascular and stroke events doubles [18]. Uncontrolled hypertension increases the risk of all-cause and cardiovascular disease mortality [19].

Numerous factors were found to add to uncontrolled hypertension. Non-adherence to antihypertensive therapy and dietary approach to stop hypertension (DASH diet), high salt intake, alcohol intake, smoking, physical inactivity, and overweight/obesity are among the major contributing factors to uncontrolled hypertension [14,20]. The benefits of comprehensive lifestyle modification, including the DASH diet and increased exercise, were tested in the PREMIER trial and demonstrated that individuals with multiple lifestyle modifications have the potential to control BP and reduce the risk of chronic disease [21].Other factors such as sex, age, disease duration, and co-morbidities also have an association with uncontrolled hypertension [20,22].

Limited information exists on BP control factors and adherence to antihypertensive drug therapy in developing countries [13]. Current disease estimates for SSA are based on limited data and hypertension control assumes a relatively low priority, and little experience exists in implementing sustainable and successful programs [23]. Although several studies have shown the prevalence and factors associated with HTN in Ethiopia, there is limited information about the magnitude and determinants of blood control status in Ethiopia. [23-25] .The lack of adequate studies on HTN significantly affects HTN management and the care of hypertensive patients in Ethiopia [26].

Improvement in the management and control of HTN will require an understanding the fac-

tors that affect BP control [25]. So, knowing the BP control status of hypertensive patients is very important for policymakers and clinicians responsible for designing appropriate strategies for better management of hypertensive patients [27]. Therefore, this study aimed to assess the magnitude and associated factors of uncontrolled BP among adult hypertensive patients attending at cardiovascular (CVS) clinic of Hawassa university comprehensive specialized hospital (HUCSH), Hawassa southern Ethiopia.

Methods and Materials

The Study Area

The study was conducted at Hawassa University's comprehensive specialized referral hospital, Hawassa, which is one of the teaching hospitals located in the Sidama Region of Ethiopia. This tertiary level Public University Hospital (PUH) is the most important in the region and serves as the last referral destination to more than 15 million people coming from Sidama, Southern Nations Nationalities & Peoples (SNNP) & neighboring Oromia regions. Hawassa is located 275 km south of the capital Addis Ababa [28].

Study Design and study period

A hospital-based cross-sectional design was conducted among adult hypertensive patients from July to September 2021.

Source Population

All adult HTN patients on medical therapy who have at least six months of follow-up at the CVS clinic of HUCSH was the source population.

Study Population

All selected adult hypertensive patients on antihypertensive treatment who have a follow-up at the CVS clinic of HUCSH at the time of data collection and have at least six months of follow-up.

Eligibility

Inclusion Criteria

Adult hypertensive patients of at least 18 years on pharmacologic therapy at least for six months or more.

Exclusion Criteria

- Hypertensive patients with only one visit to the clinic
- Hypertensive patients on pharmacologic therapy for less than six months
- Seriously ill patients not able to complete the interview and patients with incomplete medical records such as demographics and BP

Sample Size Calculations and Sampling

The sample size was calculated using single proportion population formula considering the following assumptions: Prevalence (p) of uncontrolled hypertension (UHTN) 0.7 from a study conducted at hypertensive patients attending primary health care (PHC) facilities in Addis Ababa [28], at 95% level of confidence and margin of error 5%. The total populations of hypertensive patients on follow-up at CVS clinic are 565.

The sample size is calculated by using the following formula. Where sample size (n), 565(N), 0.05(d), 0.7(p), 0.3(q) and 1.96(z).

$$\mathrm{n} = \frac{Nz^2pq}{d^2(N-1)+z^2pq}$$

$$\mathrm{n} = \frac{565*1.96^2*0.3*0.7}{0.05^2*564+1.96^2*0.7*0.3} = 206$$

Finally, the study sample was determined according to the above formulation, and adding 10% of non-response brought the final sample to 227. The estimated number of hypertensive patients during the study period was around 260; therefore, using consecutive sampling techniques the first 227 eligible hypertensive patients during the study period were included.

Study Variables

1. Dependent variable
   Uncontrolled blood pressure
2. Independent variable
   (a) Socio-demographic variables:- Sex, Age, Religion, BM, Residence, Educational status, Occupation, Marital status, Monthly family income
   (b) Health profile and related factors:- Type of diet, Alcohol consumption, Smoking, Adherence to physical activity, salt restrictions
   (c) Medication adherence related variables:- Number of antihypertensive drugs, Type(s) of antihypertensive drugs,
   (d) Presence of comorbid condition(s):- diabetes mellitus, cardiovascular diseases, and chronic kidney diseases

Operational definition

Hypertension: Persistent systolic blood pressure (SBP) readings of at least 140 mm Hg and/or diastolic blood pressure readings of at least 90mmHg are considered hypertension. For the general hypertension population taking anti-hypertensive drugs, it is considered uncontrolled if SBP is geq140mmHg and/or DBP is geq90mmHg [4].

Adherence to medications: Patients who score geq3 (range: 0–4) on the 4-item Morisky medication adherence scale Self-reported measures of medicine-taking behavior using the Green Levine Scale were categorized as either non-adherent or having good medication adherence [29].

Alcohol: following JNC7 guidelines was considered abstinence. Participants were classified as abstainers if they said they had not had any alcohol in the previous seven days or if they typically did not.

Moderation of alcohol consumption: consuming no more than two standard drinks (1 oz or 30 mL ethanol) for males and no more than one drink for females over seven days. All others were non adherent [30].

Tobacco use: a subject was classified as a smoker if they smoked at least one cigarette a day during the research [30].

Salt intake: according to WHO recommendations, optimal salt intake is defined as consumption below 5 grams equivalent to one teaspoonful. High salt intake represents a daily salt consumption of more than one teaspoonful or 5grams per day and added salt is defined as when a person uses additional salt on a plate after food preparation. Participants who used additional salt on a plate after food preparation were considered non-adherent to salt consumption, and all others were adherent.

Body mass index (BMI): Weight in kilograms divided by height in meters squared yields the body mass index (BMI), which is classified as underweight (BMI<18.5), normal (18.5-24.9), overweight (25.0-29.9), and obese ($\geq$30.0) [31].

Physically active: A person is considered physically active if they engage in regular physical activity for more than 150 minutes per week or if they report exercising for more than 30 minutes per day for more than five days per week; otherwise, they are considered physically inactive. All movement, whether it is for leisure, transportation, or employment, is referred to as physical activity.

Moderate-level activities: makes you breathe somewhat harder than the normal and include routine activities like (Walking very briskly, washing clothes, bicycling with light effort, farming activities, *etc.*) [32]. Respondents who performed such activities were assessed as having moderate-level physical activities.

Vigorous-level activities: makes you breathe much harder than normal. These are resistance activities like Jogging, Carrying heavy loads, Soccer games, *etc.* [32]. Respondents who perform such activities were assessed as having Vigorous-level physical activities.

Health Education (HE): is referred to as the process by which individuals and groups of people learn to behave in a manner conducive to the promotion, maintenance, or restoration of health

[33]. Participants who had participated in individual or group activities of the HE program/s either in person or through any media of communication within six months were considered as having HE.

Data Collection tools and Procedures

Data was collected using document review and a structured interviewer-administered questionnaire adopted from the WHO STEP-wise approach for chronic disease risk [32] and the Morisky Green Levine Scale. The questionnaire was prepared in English and translated into Amharic and contained variables on sociodemographic characteristics, smoking status, physical activity, alcohol consumption, BMI, medication adherence, and Blood pressure measurements. The dietary data were collected based on the participant's responses for which type of diet did they eat on most days (4 to 5 times per week) during the last six months after grouping it into five categories (Meat, Fruits, Vegetables, Cereal products, and Others to specify) based on WHO healthy diet guidelines. *Data for BMI was calculated after height and weight were measured and categorized into* underweight, normal, overweight, and obese.

Two BP recordings were taken from the charts of patients before six and three months, respectively. Using an automated digital sphygmomanometer BP cuff that covered two-thirds of the upper arm, the data collectors (clinical nurses and medical residents) measured the patient's third blood pressure while they were seated, had rested for at least five minutes, and had abstained from caffeine and tobacco thirty minutes prior to the measurement. The average of the three readings was used to evaluate blood pressure control. Two trained health professionals were recruited for data collection. The clarity and completeness of data were supervised by the investigator.

Data Quality Assurance

One day of training was given to the data collectors. A pretest was conducted one week before actual data collected by the investigator on 5% of the sampled patient attending a medical referral clinic (MRC) and checked for consistency, and accuracy, and any ambiguity in the checklist was corrected for final data collection. The whole data collection period was supervised by the principal investigator and any incomplete checklist was returned and corrected daily.

Data Analysis and Processing

Every piece of information gathered was examined for accuracy and consistency. SPSS version 22 was used for analysis once the data had been coded, cleaned, and input into Epi Info version 7. Tables and diagrams were used to summarize the data using univariate analysis. For every variable, descriptive statistics were calculated based on the type. For continuous variables, frequency, mean, and standard deviation were computed; for categorical variables, frequencies were computed. The relationship between each independent and outcome variable was ascertained using bivariate logistic regression; variables with a p-value $\leq$0.25 were eligible for multivariable logistic regression. Statistical significance was defined as a p-value of less than 0.05. The strength of the relationship between exposure and outcome factors was assessed using the adjusted odds ratio (AOR) with a 95% confidence interval.

Results

Socio-demographic traits

This study included 227 adult hypertension patients with a 100% response rate. 147 responses, or 64.8% of the total, were men. The respondents ranged in age from 22 to 82 years old, with a mean age of 51.4 (SD$\pm$12) years. Of the participants, 180 (79.3%) were married. Protestant followers made up the majority of responders (117, or 51.5%). Of the respondents, 76 (33.5%) worked for the government, and the majority, 56.4%, lived in cities. The majority of the study participants 116 (51.1%) earned more than 3500 ETB monthly income, and 93 (41%) of the respondents had access to higher education (Table 1).

Table 1 Sociodemographic characteristics of hypertensive patients attending at MRC of HUCSH, Hawassa, Ethiopia 2021 (n = 227)

Variables	Categories	Frequency	Percentage
Age	18-34	15	6.6
	35-49	88	38.8
	≥50	124	54.6
Sex	Male	147	64.8
	Female	80	35.2
Marital status	Single	11	4.8
	Married	180	79.3
	Widowed	22	9.7
	Divorced	14	6.2
Occupation	Government employee	76	33.5
	Retired	33	14.5
	Merchant	40	17.6
	Farmer	50	22.0
	Housewife	23	10.1
	Others	5	2.2
Religion	Protestant	117	51.5
	Orthodox	73	32.2
	Muslim	37	16.0
Residence	Urban	128	56.4
	Rural	99	43.6
Monthly Family Income	Very Low (<600)	8	3.5
(ETB)	Low (601-1500)	35	15.4
	Average (1501-3500)	60	30.0
	Above Average (>3500)	116	51.1
Educational level	Cannot read and write	12	5.3
	Primary (1-8)	24	10.6
	Secondary (9-12)	49	21.6
	Higher Education	93	41.0
	Can read and write	49	21.6

Medication adherence and BP control

The majority, 141 (62.1%) of the participants had been taking two ant-hypertensive medications per day, whereas72 (31.7%) of the participants had been put on one anti-hypertensive drug, and the remaining 14 (6.2%) of the participants had been taking three or more drugs per day. Frequently used drugs were hydrochlorothiazide (HCT) 26(11.5%), amlodipine 20(8,8%), and enalapril 19(8.4%). However, commonly prescribed two drug combinations were amlodipine + enalapril (45%) and HCT + nifedipine (44%). Among the respondents, 208 (91.6 %) were classified as having good adherence to prescribed medications.

The mean systolic and diastolic BP readings were 144.75 mm Hg (±10.40SD) and 86.59 mm Hg (±8.18 SD) respectively. One hundred

twenty-two (53.7%) of the participants had uncontrolled systolic, and 84 (37%) of the study participants had uncontrolled diastolic blood pressure. The overall magnitude of uncontrolled hypertension was 57.3% (Table 2).

Table 2 The type of antihypertensive drugs taken by study participants (n = 227)

Types of drug/s	Controlled BP	Uncontrolled BP	Ch-square *p*-value	Total (%)
HCT	14	12	.409	26 (11.5)
Amlodipine	11	9	.411	20 (8.8)
Enalapril	11	8	.288	19 (8.4)
Nifedipine	4	3	.557	7 (3.1)
Amlodipine + enalapril	21	24	.951	45 (19.8)
HCT + enalapril	20	24	.951	44 (19.4)
HCT+ nifedipine	7	5	.389	12 (5.3)
HCT + amlodipine	6	3	.210	9 (4)
Nifedipine + Lasix	6	4	.373	10 (4.4)
HCT + atenolol	3	5	.613	8 (3.5)
HCT + amlodipine + enalapril	6	8	.792	14 (6.2)
enalapril + metoprolol	8	5	.389	13 (5.7)
One drug	40	32	.077	72 (31.7)
Two drugs	71	65	.028	141 (62.1)
Three or more	6	8	.792	14 (6.6)
Total	117	110		227 (100)

Health Profile and Related Factors

The majority, 134 (59%) and 40 (19%) of participants ate cereal products and vegetables on most days of the week respectively. One hundred forty-one (62.1%) of participants added salt after preparing food. Nine (4%) of participants were current smokers and 13 (5.7%) reported that they drank alcohol daily. More than half of the participants (55.1%) were classified as having moderate levels of physical activity. One hundred ten (48.4%) of respondents had normal BMI and 87(38.4%) & 30(13.2%) were found overweight and obese respectively (Table 3).

Comorbidities and Family History of Hypertension

Of all respondents 58 (25.6%), 35 (15.4%), and 27 (11.9%) have diabetes mellitus, cardiovascular diseases, and chronic kidney diseases respectively. Forty-four (19.4%) of the respondents reported they had a family history of hypertension (Table 3).

Table 3 Behavioral and lifestyle characteristics of adult hypertensive patients attending at medical referral clinic of HUCSH, Hawassa, Ethiopia 2021 (n = 227)

Variables	Category	Controlled BP	Uncontrolled BP	Ch-square *p*-value	Total
Current smoking status	No	95	123	.082	218
	Yes	2	7		9
Current alcohol consumption	No	94	120	.040	214
	Yes	3	10		13
Use of added salt	No	54	32	.002	86
	Yes	43	98		141
Physical activity	Inactive	30	72	.001	102
	Active	67	58		128
BMI	18.5–24.9	73	36	.042	109
	25–29.9	18	69		87
	≥ 30	5	25		30
Presence of comorbid conditions	No	53	78	.213	131
	Yes	44	52		96
No of anti-HTN medications	One	41	32	.076	73
	Two	54	79		133
	≥Three	2	19		21
Adherence	Adherent	94	114	.003	208
	Non adherent	3	16		19

Determinants of Uncontrolled Blood Pressure

Out of fifteen variables analyzed in the bivariate analysis, only five variables (use of added salt, physical activity, BMI, adherence to medication, and health education) were statistically significant predictors of uncontrolled hypertension at *p*-value <0.05 in the multivariable logistic regression model (Table 4).

Hypertensive patients who used top-added salt on a plate were 2.6 times more likely to have uncontrolled BP than patients who didn't consume added salt (AOR = 2.6, 95% CI: 1.019, 6.707). Non-adherence to physical activity had 2.619 more risks of uncontrolled hypertension (AOR =2.619, 95% CI: 1.089, 6.300) than those with physically active hypertensive respondents.

Patients who were overweight were 7.526 times more likely than those who were normal weight to have uncontrolled hypertension (AOR = 7.526, 95% CI: 2.932, 19.317), and those who were obese were 19.707 times more likely to have uncontrolled hypertension (AOR = 19.707, 95 %CI: 4.518, 85.967

Hypertensive patients who were non-adherent to anti-hypertensive medication had 5.588 more likely to have uncontrolled hypertension than those with good adherence (AOR = 5.588, 95% CI: 1.160, 26.918). Hypertensive patients who did not have health education were 3.3 more likely to have uncontrolled hypertension than those who received health education (AOR =3.3, 95% CI: 0.137, 8.03) (Table 4).

Table 4 Determinants of uncontrolled blood pressure among adult hypertensive patients attending at medical referral clinic of HUCSH, Hawassa, Ethiopia 2021 (n = 227)

Variables	Category	Blood pressure control		Crude OR (95% CI)	Adjusted OR (95% CI)	*P*-value
		Controlled BP	Uncontrolled BP			
Residence	Urban	48 (49.5%)	80 (61.5%)	1	1	
	Rural	49(50.5%)	50 (38.5%)	0.612(0.360,1.042)	0.919(.302,2.799)	0.882
Current smoking	No	95(97.9%)	123(94.6%)	1	1	
	Yes	2 (22.2%)	7 (77.8%)	2.703(0.549,13.311)	0.989(.021, 47.550)	0.996
Current alcohol consumption	No	94(96.9%)	120 (92.3%)	1	1	
	Yes	3(3.1%)	10(7.7%)	2.611(0.699,9.576)	0.371(0.045, 3.035)	0.355
Use of added salt	No	54 (62.8%)	32 (37.2%)	1	1	
	Yes	43 (30.5%)	98 (69.5%)	3.846(2.185,6.770)	2.614(1.019, 6.707)	0.046
Physical activity	Inactive	30(29.4%)	72 (70.6%)	1	1	
	Active	67(69.1%)	58 (44.6%)	2.772(1.596, 4.816)	2.619(1.089, 6.300)	0.032
BMI	18. 25–29.9	73(75.3%)	36 (33%)	1	1	
	25–24.9	18 (18.6%)	69 (53.1%)	7.880(4.097,15,154)	7.526(2.932, 19.317)	0.001
	≥ 30	5 (5.2%)	25 (19.2%)	10.278(3.635,29.064)	19.707(4.518, 85.967)	
Adherence	Adherent	94 (96.9%)	114(87.7%)	1	1	
	Non-adherent	3 (3.1%)	16 (12.3%)	4.398(1.244,15.550)	5.588 (1.160, 26.918)	0.032
Health education	No	36(27.1%)	78(60%)	1	1	
	Yes	61(62.9%)	52(40%)	0.393(0.229,0.676)	0.332(0.137, 0.803)	0.014
Family history of hypertension	No	82 (84.5%)	101(77.7%)	1	1	
	Yes	15 (15.5%)	29 (22.3%)	1.570(0.789,3.123)	3.898(1.172,12.964)	0.126
Number of anti-HTN medications	One	41 (42.3%)	32(24.6%)	1	1	
	Two	54 (55.7%)	79 (60.8%)	1.874(1.052,3.339)	0.283(0.013, 6.326)	0.426
	≥Three	2 (2.1%)	19 (14.6%)	12.172(2.639,56.134)	0.413(.012, 13.702)	0.620

Discussion

In many developing nations, like Ethiopia, controlling blood pressure in individuals with hypertension to lower cardiovascular morbidity and mortality is a significant and difficult public health issue. Despite being on follow-up at the referral hospital, 57.3% of hypertension patients had uncontrolled blood pressure, according to this study. This finding was in line with studies done in Ghana (57.7%) [34], South Asia (58.0%) [35], South Africa (58.1%) [36], Ayder comprehensive specialized hospital; Ethiopia (56.1%) and Jimma university hospital, Ethiopia (52.7%) [25,37].

However, this is higher than the findings reported from Israel (35.9%), Sudanese adults (64%), and Gondar university hospital, Ethiopia (37%) [38-40]. This could be explained by the fact that, in comparison to the study conducted in Israel, our study had lower rates of medication adherence, usage of added salt, overweight and obesity, and health education. In addition, this might be due to socio-cultural and behavioral differences in the population and healthcare services differences in the study settings.

On the contrary, the magnitude of uncontrolled hypertension in this study is lower than the study done in Panama (66.7%) [41], Morocco 82.8% [42], the Democratic Republic of the Congo (77.5%) [43], South Africa (75.5%) [44] and Zewditu Memorial Hospital, Ethiopia (69.9%) [16]. The operational definition of uncontrolled hypertension, the degree of co-morbidity, adherence to alcohol abstinence, smoking, and research participant age could all be contributing factors to this discrepancy.

Compared to the other studies, this study revealed a lower rate of co-morbidity among hypertensive patients. Most of the studies had a high proportion of co-morbidities or were exclusively done among hypertensive patients with chronic

co-morbidities [42]. Many chronic diseases are secondary causes of HTN, and controlling HTN among hypertensive patients with other chronic co-morbidities like diabetes mellitus and chronic kidney disease might be challenging [13,44]. The study done in the Democratic Republic of Congo has operationally defined uncontrolled hypertension as BP of ≥130/80 for hypertensive patients with chronic co-morbidities [43]. As a result, this lower cut point could contribute to the increased prevalence of uncontrolled hypertension

Compared to our study, the studies done in China, Morocco, the Democratic Republic of Congo, South Africa, and Zimbabwe had a higher proportion of older adults, despite the study in China was being done exclusively among older adults [36,43,44]. Even though our study did not show a significant association of age with uncontrolled hypertension, many previous studies revealed advanced age is an independent predictor of uncontrolled hypertension [37,42]. Additionally, higher adherence to alcohol abstinence in this study could have contributed to the lower prevalence of uncontrolled hypertension in this study compared to other studies done in Ethiopia [45].

While some variables have not yet demonstrated a significant association in this study, the majority of the results are in line with other comparable studies conducted in other nations. Performing adequate physical activity, being overweight, using top-added salt on the plate after meal preparation, and non-adherence to antihypertensive medications are consistent with the findings of other similar studies. However, age, comorbidities, smoking, and educational level did not show a significant association in this study.

Performing adequate physical activity has a strong and independent role in reducing blood pressure. This study is consistent with the previous report from other sub-Saharan countries and southern China [46,47]. It showed that individuals who engaged in moderate levels of physical exercise were more likely than those who did not to have optimal blood pressure control. Physical activity significantly lowers blood pressure and causes weight loss, according to epidemiological research. Sedentary life, which is a known predictor of obesity, is one of the major risk factors for high blood pressure and thus non-adherence to physical exercise makes it difficult to control hypertension [5].

Similarly, this study also revealed poor BP control in overweight patients. The result is similar with studies done in China [36]. Higher BMI (overweight and obesity) is one major contributing factor to hypertension. Many health studies have consistently identified that BMI and blood pressure have a direct and apparent dose-response relationship [46]. Obesity causes hypertension by activating the sympathetic nervous system, the amount of intra-abdominal and intra-vascular fat, sodium retention leading to an increase in renal reabsorption, and the renin-angiotensin system are considered to have important roles in the pathogenesis of obesity-related hypertension [47].

In this study, the use of top-added salt on the plate following meal preparation was substantially linked to uncontrolled blood pressure. This result is similar to studies done in Southern China [36], and may be due to high salt intake causing fluid retention that increases cardiac burden resulting in high blood pressure.

Uncontrolled hypertension was independently predicted by non-adherence to antihypertensive treatment. This result is in line with studies done in Ghana, and the University of Gondar hospital, Ethiopia, that showed poor adherence or non-adherence to anti-hypertensive medication was found statistically associated with uncontrolled hypertension [34,40].

Study Limitations

The following are the limitations of this study: The study excluded a number of important confounding factors, including coffee consumption, khat chewing, and biochemical tests.

Conclusion

It was discovered that the degree of uncontrolled hypertension was high. The independent predictors of uncontrolled hypertension included using top-added salt, being overweight or obese, not exercising, not taking anti-oviders and other stakeholders should encourage overweight hypertensive patients to lose weight.

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Ethics Approval

Formal letters were prepared and presented to the hospital administration. Ethical approval was obtained from the Institutional Review Board (IRB) of Hawassa University comprehensive specialized Hospital. Informed verbal consent was obtained from every participant. All the information retrieved was kept in a way that could not disclose personal confidentiality. The data and information collected or analyzed were held confidential. We confirm that our study complies with the Declaration of Helsinki.

Availability of Data and Materials

Authors of this manuscript had full access to all of the data (including statistical reports and tables) in the study and can take responsibility for the integrity of the data and the accuracy of the data analysis. All the data included in the manuscript can be accessed from the corresponding author upon request.

Competing Interests

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RESEARCH ARTICLE

Cotrimoxazole prophylaxis, poor drug adherence, nutritional and educational status are key predictors of first-line antiretroviral therapy (ART) treatment failure among adults in Southern Ethiopia

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Abstract

Background: The advent of antiretroviral therapy (ART) for HIV-infected patients has led to a significant decline in HIV-related morbidity and mortality conditions, globally. However, drug resistance with subsequent treatment failure becomes a great challenge.

Objective: This study aimed to determine the incidence and key factors associated with treatment failure of first-line ART therapy among adults living with HIV in Gedeo Zone of the southern Ethiopia region.

Methods: A facility-based retrospective follow-up study involving 509 patients who were 15 years and above old who started first-line ART between 2010 and 2017 was conducted at health facilities in Gedeo zone of southern Ethiopia. Data were collected from Dilla university referral hospital and Yirgachefe hospitals between March to April 2018. Systematic random sampling was used to select the study participants. Data were collected by five trained nurses. Survival analysis with a Cox proportional hazard model was fitted to determine factors associated with ART treatment failure. Variables with a p-value of ≤ 0.05 in multivariable cox regression were considered statistically significant determinant factors.

Result: For a total of 3157 person-years follow-up or 509 adult HIV-infected patients on first-line ART at both hospitals, the cumulative treatment failure rate was found to be three per 100 person-years or nearly one in five 94 (18.5%). Using the cox hazard analysis at multivariate level, cotrimoxazole prophylaxis (AHR 2.96; 95% CI 1.35 to 6.47), poor adherence to ART (AHR 1.31; 95% CI 1.12 to 1.72), being malnourished (AHR 1.78; 95% CI 1.03 to 3.12), and lack of formal education (AHR 2.25; 95% CI 1.24 to 4.08) were independent predictors of treatment failure.

Conclusion: The cumulative rate of treatment failure in the study area is high. Poor treatment adherence, cotrimoxazole prophylaxis, and educational and nutritional status were found to be key predictors of treatment failure. Therefore, health system strengthening and nutrition interventions are essential to improve the rate of treatment failure.

Keywords: Adults, First-line Antiretroviral Therapy, HIV, Predictors, Treatment Failure

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Background

Worldwide Human Immunodeficiency Virus (HIV) continues to be a major public health problem, approximately 37.9 million people were living with HIV at the end of 2018 [1]. From the global burden,the majority of the HIV-infected people were living in sub-Saharan Africa [2] and in Ethiopia, according to the 2016 Ethiopia Demographic Health Survey (EDHS) report the prevalence of HIV among adults was 0.9 percent and the magnitude is seven times higher in urban areas than in rural areas [3].

In the world,because of the starting of highly active antiretroviral therapy (HAART), morbidity and mortality have considerably reduced [4].The WHO report shows that in low- and middle-income countries, 62% of adults living with HIV were getting lifetime antiretroviral therapy in 2018 [1].

A combination of two nucleoside/nucleotide reverse transcriptase inhibitors (NRTI) with one non-nucleoside reverse transcriptase inhibitor (NNRTI) is a standard first-line regimen and the majority of the patients start their treatment with this ART regimen. First-line treatment failure after initiation of HAART can be assessed by clinical (the appearance of new opportunistic infections, ongoing weight loss, *etc.*), immunologic (a decline in CD4 count), or virologic (a viral rebound above a set of the threshold of 200 copies/ml) criteria [5]. A combination of clinical and immunologic monitoring or clinical monitoring alone is used to assess the response to ART and to determine treatment failure in settings in which there is no access to viral load testing [6].

According to a study done in India,the first-line ART treatment failure prevalence was 12.4% [7], Studies in East Africa have shown that immunologic failure ranges from 8% to 57% [8]. The failure rate in Ethiopia was found to be high. The study conducted at Debremarkos Hospital showed that 21% of the HIV patients had developed immunological failure with a failure rate of eight per 100 patient-years of follow-up [9],and in the University of Gondar referral hospital, northwest Ethiopia, the prevalence was (4.1%) [10]. In a study done in southern Ethiopia, 17.6% of the patients were found to have immunological treatment failure [11].

The factors associated with treatment failure from different kinds of literature include; old age group and educational status [12], urban areas,negative change in absolute lymphocyte count, a negative change in hemoglobin concentration, a negative change in body weight, and previous history of anti-tuberculosis treatment [7], Having WHO Stage III/IV [11], and low baseline CD4 count [12, 13, 14], zidovudine-based ART, and poor adherence [13], and cotrimoxazole prophylaxis (CPT) had a protective effect on peoples living with HIV/AIDS [15].

Delayed detection of treatment failure may increase drug toxicity/and may result in increased morbidity and mortality. Since second-line treatments are the next, most expensive, and the only options after failure of first-line ART as per the Ethiopian ART treatment guideline, it is crucial and timely to know the rate of failure and its predictors. Therefore, this study aimed to determine the incidence of first-line ART treatment failure and to identify the risk factors that contribute to treatment failure among adult HIV patients who were on ART follow-up in the Gedeo zone by using the three WHO criteria. It will help as a guide for health professionals and higher officials to alleviate the problem and to develop strategies to decrease the rate of treatment failure, and also inform the respective stakeholders about the current state of first-line ART users.**Ethical Consideration**

Ethical clearance was obtained from the Institutional review board of Dilla University, College of Health and Medical science. After that support letter was obtained from the Gedeo Zone health office and Permission was also obtained from the directors of each of the hospitals from whose HIV clinics data were used for this study. Informed consent was not obtained since there was no interaction with human subjects as the data were collected from patient charts and log-

books. Names of patients were not included during data collection. The collected data were kept confidential and used only for the study.

Methods and Materials

Study design

A facility-based retrospective follow-up study was conducted in the Gedeo zone of the southern region of Ethiopia between March and April/2018. Study area: This study was conducted in two selected hospitals in Gedeo zone. The zonal capital, Dilla town is located 360km south of Addis Ababa. Gedeo has six woredas or districts and two city administrations with an estimated total population of 1,086,768 (532,516 (49%) male and 554,225 (51%) female). The total land of Gedeo is estimated to be above 1,210.89 square kilometers. There are a total of 276 health facilities from this one referral hospital, three district hospitals, 38 health centers, and 146 health posts. ART services are available in seven health centers and four hospitals in the Gedeo zone.

Participants

The source population for this study includes all HIV-positive adults age15 years and above who started first-line ART in Gedeo zone hospitals, SNNPR, Ethiopia between February 2010 and 2017. All HIV-positive adults age15 years and above who started first-line ART at Dilla university referral hospital and Yirgachefe primary hospital and followed at least 6 months between February 2010 and 2017 were included. Patients who had incomplete information about the outcome variable were excluded. The sample size was determined by using two population calculations formula. By using confidence level=95%, Power=80%, t sample size=539

Variables

Dependent variable: Treatment failure of first-line ART and its time of occurrence

Explanatory variables:

Socio-demographic characteristics: Age, sex, educational status, marital status Clinical characteristics: WHO clinical staging, Functional status, CD4 count at the shift of ART, change in weight, presence of OI, calendar year of starting first-line ART, Presence of active TB, and TB treatment.

Treatment-related. Drug regimen, OI prophylaxis, CPT, INH prophylaxis, history of first-line modification, treatment duration, number of changed NRTIs, and drug side effects.

Operational definition

Treatment failure: is considered a composite outcome of immunological failure, clinical failure, and virological failure. If a patient had one of the three outcomes, he/she is considered as having treatment failure.

Clinical failure: New or recurrent clinical event indicating severe immunodeficiency. WHO clinical stage 4 conditions and certain WHO clinical stage 3 conditions (such as pulmonary TB and severe bacterial infections) after 6 months of effective treatment.

Immunological failure: Failure is defined if at least one of the criteria below is fulfilled: follow-up CD4 count fall to or below baseline values, a 50% fall from on treatment peak value, or persistent CD4 levels below 100 cells/mm3.

Virological failure: a viral rebound above a set of a threshold of 200 copies/ml) criteria.

Data collection technique

The data were collecte dfrom patients' charts, computer databases, and logbooks by using A standardized data extraction checklist prepared by the investigators. Five BSC nurses who have experience of working at the ART clinic participated in the data collection process after one day of training is given and supervised by 4 supervisors.

Data quality assurance

Training on the objective of the study and how to review the documents as per the data extraction format was given to data collectors and the supervisor for one day before data collection. The data extraction checklist was pre-tested for consistency of understanding the review tools and completeness of data items, and the necessary adjustments made to the final data extraction format. The filled formats were checked for completeness by the principal investigator and/or the supervisors daily.

Data processing and analysis

The data was entered into EPI info version 7 and transferred to STATA version 12.0 for analysis. Descriptive and summary statistics were carried out. The rate of failure of the composite outcome (treatment failure) was measured for each of the outcomes separately. Person time at risk was measured starting from the time of starting the treatment until each patient ends the follow-up. Survival analysis with a Cox proportional hazard model was used to identify determinant factors of treatment failure. Schoenfeld residuals test (both global and scaled) and -Ln(-ln) graphs were used to check the Cox proportional hazard assumption. Both bivariable and multivariable Cox proportional hazards models were used to identify predictor variables. Variables having p-value 0.2 or less in the bi-variable analysis were fitted into the multivariable model. A ninety-five percent confidence interval of hazard ratio (HR) was computed and variables having a p-value less than 0.05 in the multivariable Cox proportional hazards model were considered as significantly associated with treatment failure.

Ethical Consideration

Ethical clearance was obtained from the Institutional review board of Dilla University, College of Health and Medical science. After that support letter was obtained from the Gedeo Zone health office and Permission was also obtained from the directors of each of the hospitals from whose HIV clinics data were used for this study. Informed consent was not obtained since there was no interaction with human subjects as the data were collected from patient charts and logbooks. Names of patients were not included during data collection. The collected data were kept confidential and used only for the study.

Results

Baseline socio-demographic characteristics

In this study, a total of 539 charts of adult HIV-infected patients on first-line ART were reviewed, then 30 samples were excluded because of the incompleteness, and 509 collected samples were included in the analysis. The median age of the patients at the start of antiretroviral treatment was 32 years with an Inter-quartile range (IQR of 12 years). The majority of the participants, 289 (57%), 360 (70.7%), and 274 (54.4%) were female by gender, with no formal occupation and under 32 years by age,respectively. Close to two in every five or 161 (38.33%), had a primary educational status and some 120 (28.57) had no formal education (Table 1).

Clinical and immunological characteristics

About two-third or3 40 (66.80%) of the study participant had a working functional status and 293 (57.792%) were in WHO clinical stages III & IV. About four in five or 399 (78.51%) of the patients had poor adherence levels, and close to a quarter or 96 (22.9%) were malnourished. About six in five 433 (87.12%) and slightly above half 261 (53.37%) were given cotrimoxazole and Isoniazid (INH) preventive therapies, respectively. Among the study participants, only one in ten, or 51 (10.2%) had a CD4 count of ≤ 50 cells/mm^3 (Table 2).

Table 1 Socio-demographic characteristics of adult HIV patients on first-line ART in Gedeo zone, SNNPR, Ethiopia, 2018

Variable	Category	Frequency	Percent (%)
Gender	Female	289	57
	Male	220	43
Occupation	Employed	149	29.3
	unemployed	360	70.7
Age	<32 years	274	54
	32-40 years	148	29.2
	>40 years	85	16.8
Educational status	Lack of formal education	120	28.57
	Primary	161	38.33
	Secondary	94	22.38
	Tertiary	44	10.48

Table 2 Clinical and immunological characteristics of adult HIV patients on first-line ART in Gedeo zone, SNNPR, Ethiopia, 2018

Variable	Category	Frequency	Percent (%)
Re occurrence OI	Yes	57	12.72
	No	390	87.28
Past TB Rx	Yes	117	23.17
	No	387	76.63
CD4 (cells/mm^3)	≤50	51	10
	51-200	187	37.4
	>200	262	52.4
Functional status	Working	340	66.80
	Ambulatory	145	28.49
	Bedridden	23	4.52
WHO stage	Stage 1	122	24.06
	Stage 2	91	17.95
	Stage 3	265	52.27
	Stage 4	28	5.52
Adherence	Poor	399	78.57
	Good	110	21.43

OI=Opportunistic infection, TB=Tuberculosis, RX=Treatment

Treatment failure on first-line ART

Among a total of 509 adult HIV-infected patients on first-line ART treatment, 95 (18.5%) had reported treatment failure; of which, close to three-fourth or 69 (72.63%) had immunological while the rest 12 (12.63%), 7 (7.31%) had virological, and clinical treatment failures, respectively. Nearly one in every 13 or 7 (7.35%) had all three types (immunological, virological, and clinical) of treatment failure. The mean follow-up time of the patients on first-line ART was 49.51 months (sd=28.18) while the study cohort had contributed to a total of 3157 person-years of follow-up. Over the study period, the total treatment failure rate was three per 100 person-years.

Predictors of treatment failure on first-line ART

In the bi-variable cox proportional hazard analysis,educational status, INH, CPT, nutritional status, and adherence were statistically significant factors of treatment failure in adult HIV-infected patients on first-line ART. In the advanced multivariate Cox regression analysis; however, CPT (AHR 2.96; 95% CI 1.35 -6.47), poor adherence (AHR 1.31; 95% CI 1.12 -1.72), being malnourished (AHR 1.78; 95% CI 1.03 -3.12), and lack of formal education (AHR 2.25; 95% CI 1.24 -4.08) remained to be independent significant predictors of treatment failure.

The rate of treatment failure was 2.25 times higher among those who had no formal education as compared with those who had secondary educational status. Good adherence and taking CPT had a protective effect on treatment failure. The risk of treatment failure was 1.31 times more likely among patients who had poor adherence as compared tothose who had good adherence. Patients who did not take CPT were 2.96 times more likely to have treatment failure as compared to those who were taking CPT. The risk of treatment failure was 1.78 times more likely among malnourished patients as compared to those who were not malnourished (Table3).

Table 3 Bi-variable and multivariable Cox regression analysis of treatment failure and predictors of first-line antiretroviral therapy among adults living with HIV in the Gedeo zone, SNNPR, Ethiopia, 2018

Variable	Failure status		Crude HR (95% CI)	Adjusted HR (95% CI)
	Event	Censored		
Educational status				
No formal education	21	98	1.6 (.950-2.83)	2.25 (1.240-4.082) *
Primary	28	133	1.6 (.939- 2.759)	1.5 (0.865-2.793)
Secondary	19	75	1	1
Tertiary	14	30	0 .64 (0.268- 1.539)	0.73 (0 .27-1.92)
CPT				
No	11	52	1.64 (0.87-3.11)	2.96 (1.35-6.47) *
Yes	81	352	1	1
Nutritional status				
Not malnourished	64	259	1	1
Malnourished	20	71	1.41 (0.89-2.27)	1.78 (1.03-3.12) *
Adherence				
≥85% (good)	56	288	1	1
<85% (poor)	31	80	1.38(1.102-1.74)	1.31 (1.12-1.72) *
Functional status				
Working	63	277	1	1
Ambulatory	27	117	0.97 (0.662-1.438)	0.87 (0.562 - 1.37)
Bedridden	4	19	2.6 (1.467-4.640)	1.4(.671-2.91)
WHO stage				
Stage 1 & 2	39	174	1.48 (0 .856-2.569)	1.1 (0.606 - 2.33)
Stage 3	48	216	1	
Stage 4	6	22	0.75 (0.433- 1.299)	0.56(0.234 - 1.37)

Event=treatment failure; Censored=transfer out + lost to follow up+death+alive(on treatment at the end of the study); CPT= cotrimoxazole preventive therapy,HR=Hazard ratio; CI=Confidence interval; * is to indicate significant factors; 1=reference

Discussion

This study aimed to measure the treatment failure rate and predictors of first-line antiretroviral therapy among adults. The incidence of treatment failure in this study was three per 100 person-years which is lower as compared with an incidence rate of 8 per 100 person-years in a study done in DebreMarkos, Ethiopia [9]. In this 7- year's retrospective follow-up study, 18.5% of the adult HIV-infected patients on first-line ART had treatment failure which is in agreement with a study done in southern Ethiopia 17.6% patients were found to have treatment failure [11]. However, the prevalence of treatment failure in this study is lower than in a study done in Debremarkos (21%) [9] and it is higher in contrast to a study done in India (12.4%) [7] and the University of Gondar (4.1%) [10]. The reason for this might be due to the differences in the study settings, follow-up time, sample size, and the diagnostic criteria of treatment failure.

In this study, different factors have been identified as predictors of treatment failure on first-line ART. In the multivariate analysis; nutritional status, educational status, adherence, and cotrimoxazole preventive therapy were found as significant determinants of treatment failure. In our study nutritional status was the determinant factor of ART treatment failure. The rate of treatment failure was higher among malnourished patients as compared with those none malnourished patients. This finding is consistent with the study done in India [7]. The reason for this might be that malnutrition reduces the capacity of the body to fight infection by compromising various immune parameters. Malnutrition in HIV patients contributes to the rapid progression of HIV infection to AIDS [16]. So these patients should take medications to treat these infections. During taking these medications there might be drug interaction that could lead to treatment failure.

Educational status was also a determinant factor of treatment failure. This finding is consistent with a study done at the University of Gondar [12]. The reason might be having no formal educational status might be associated with ART non-adherence and this might lead to treatment failure.

Poor adherence was also a determinant of treatment failure in this study. Poorly adhered patients had a higher risk of ART treatment failure. This finding is consistent with the study done among HIV-infected African patients [13]. This might be because adherence to ART plays a vital role in the success or failure of therapy for HIV infection. Low levels of adherence are a great problem among these patients due to that Poor adherence leads to virologic failure and a high risk of drug resistance, progression to AIDS, and death [17-19].

In this study, those patients who took cotrimoxazole preventive therapy were at a lower risk of developing ART treatment failure as compared to those who did not take this preventive therapy. This finding is consistent with the study done university of Gondar [15]. This might be because cotrimoxazole preventive therapy reduces severe bacterial infections, malaria, and also hematological adverse events [20].

The main strength of this study is the large sample size, and the follow-up time was long enough to estimate ART treatment failure and its determinants. Among the major limitations, attributable to the use of retrospective documented data, there were incomplete follow-up records (due to patients' missed clinical visits, under-reporting of clinical conditions, and laboratory results like CD4 count). The other limitation is the viral load was not done continuously, because of the cost burden to the client, which made the study difficult to estimate correct viral load characteristics. In this study, treatment failure is a composite variable of clinical, immunological, and virological failure. So under-reporting of these three variables might under-estimate the outcome variable.

Conclusion

The rate of treatment failure was higher and higher treatment failure among adult HIV-infected patients was associated with poor adherence, no formal educational status, not taking CPT, and being malnourished. Cotrimoxazole prophylaxis should be given to the recommended patients. The ART centers need to establish and rapidly expand awareness and counseling programs to facilitate and motivate HIV-infected patients to improve adherence and nutritional intake. ART centers and those who treat patients should record the treatment failure appropriately.

Assertions

Abbreviations and Acronyms

AIDS	Aquired Immune-Deficiency Syndrom
AHR	Adjusted Hazard Ratio
ART	Anti Retroviral Therapy
CI	Confidence Interval
CPT	Cotrimoxazole Preventive Therapy
EDHS	Ethiopian Demographic and Health Survey
HAART	Highly Active Antiretroviral Treatment
HIV	Human Immunodeficiency Virus
HR	Hazard Ratio
INH	Isonizid Proplaxis
NGO	Non-Governmental Organization
NNRTI	Non-Nucleoside Reverse Transcriptase Inhibitors
NRTI	Nucleoside/Nucleotide Reverse Transcriptase Inhibitors
OI	Opportunistic Infection
SD	Standard Deviation
SNNPR	Southern Nations, Nationalities and Peoples Regional State
TB	Tuberculosis
WHO	World Health Organization

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Competing Interests

The authors declare that they have no competing interests.

Availability of Data and Materials

All the data included in the manuscript can be accessed from the corresponding author Wagaye Alemu upon request through the email address "wagaye6alemu@gmail.com".

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Author's Contributions

WA designed the study, coordinated the data collection, analyzed the data, interpreted study findings, wrote up the primary draft of the manuscript,and also revised the manuscript. ZB involved in the interpretation of the study findings, reviewed, and assisted with the critical revision of the manuscript. TS was significantly involved in the selection of articles, and manuscript preparation and revision. All authors contributed to the writing of the paper. All authors read and approved the final manuscript to be published and agreed to be accountable for all aspects of the work.

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RESEARCH ARTICLE

Prevalence of Suicidal Ideation, Attempt, and associated factors among Adolescents in Southern Ethiopia: A cross-sectional study

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Abstract

Background: Subscale ideation and attempt are common among adolescent compared to general population. However, little is documented about the problem in Ethiopia. .The study aimed to assess the prevalence of fiducial ideation,attempt and associated factors among adolescent in Dilla town

Methods: A community-based cross-sectional study was employed among 517 adolescent in Dilla town from May 01 to June 30, 2019. Data were collected using pretested interviewer-administered tools. Sucidality model of world mental health survey initiatives version 3.0 of the WHO composite international diagnostic interview were used. Data were entered into epi-data version 3.1 and exported to SPSS version 20 for analysis. Descriptive statistics were computed, and binary logistic regression model was used.In multi-variable binary logistic regression, variables having p-value < 0.05 were declared statistically significant at corresponding 95% CI.

Result: The prevalence of suicidal ideation and attempt among adolescents in Dilla town were 12.4% (95% CI, 9.3-14.9) and 7.2% (95% CI: 5.0-9.5), respectively. Being female, life time use of khat, and mental distress were variables statistically associated with suicidal ideation, whereas poor social support, mental distress, and current use of khat were variables associated with suicidal attempt.

Conclusion: Suicidal ideation and attempt in this study is high. Screening and identification of risky suicidal behaviors among adolescents is essential. More emphasis should be invested among females, substance users and those with emotional disturbance.

Keywords: Adolescents, Ethiopia, Suicidal attempt, Suicidal ideation

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Background

Suicidal behaviors can be explained as a complex process that includes suicidal ideation, planning, attempting suicide and final act of committing suicide[1]. Suicide remains a significant social and public health problem [2]. Now days, World Health Organization (WHO) reported that, more than one million people died by suicide worldwide each year [1, 3]. Suicide is increasingly becoming a notable global public health problem, and it is now the tenth leading cause of death in the general population and the second among adolescents [4]. In the general population annual global suicide rate is 11.4 per 100,000 population or one death every 40 seconds [5]. Globally, suicide accounts for an estimated 6% of all deaths among young people [6]. In developed European countries, the lifetime prevalence of suicidal ideation and attempt among students aged 15–16 years was ranged from 15% to 31.5%, and 4.1% to 23.5%, respectively [7]. In low and middle-income countries, 15.3% of adolescents aged 13–15 years had seriously considered suicide in the past year [8]. It is estimated that there are 10 to 40 nonfatal suicide attempts for every completed suicide [9, 10]. This number increases to 100 to 200 for adolescents [10, 11]. Suicidal ideation often emerges in adolescence and is prevalent among this age group, particularly among females [6]. Overall, although the suicide rate increases with age, suicidal behavior is high and is increasing among young people between the ages of 15 and 19 [12]. As a consequence, suicidal behavior is not only a problem for victims but it has also emotional disturbance for the family members [13, 14]. The attitude and factors associated with suicidal behaviors might be varied depending on the culture of the country in which an individual belongs [15]. Literatures revealed that being female, poor social support, economical problems, separation from partners and previous history of mental illness were some of the risk factors of suicidal behaviors [2, 16]. Despite adolescent suicidal behavior is a common public health problem, less attention is given especially in middle and low-income countries [7, 8, 17-20]. Although suicide continues to remain a serious problem in high-income countries, it is the low and middle-income countries that bear the larger part of the global suicide burden [2]. Besides, developing countries are not well equipped to prevent suicidal behaviors.

In Ethiopia, there are some studies done regarding suicide but the focus was among chronic medical conditions (Tuberculosis, HIV/AIDS patients) [21, 22]. However, there is a dearth of information particularly in community adolescents where many predisposing and precipitating factors of suicidal behaviors are common [23-26]. Since adolescents are the future light of development for one country, identifying the burden and potential risk factor is essential for preventing and giving appropriate intervention among individuals with suicidal behaviors. Thus, our study aimed to determine the prevalence and associated factors of suicide ideation and attempt among adolescent living in Dilla town, Southern Ethiopia.The findings of this study will help the institution to develop appropriate plans and intervention to adolescents with suicidal risk.

Methods

Study design and period

A community based cross-sectional study design was employed.

Study setup

The study was conducted in Dilla town. Dilla town is among eleven zones fond in Southern Ethiopia. The town is located at 360 kilometers away from Addis Ababa (the capital city of Ethiopia) to the South. Dilla town has three sub-cities (Bedecha, Sessa and Harowolabo), and in each sub-cities there were six (6) kebeles (the smallest administrative unit in Ethiopia). Based on the 2007 Census conducted by the central statistical agency (CSA), Dilla town has a total population of 59,150, where 31,068 were men and 28,082 were women [27]. Unlike that of other towns found in Ethiopia, people from different ethnic backgrounds are living in Dilla town almost in unbiased proportion. The town has one governmental referral and teaching hospital (Dilla University Referral Hospital), two

health centers and more than 12 private clinics. Mental health service was provided only in the referral and teaching hospital with both outpatient and inpatient department. As information given from Dilla town administration office there are more than 11, 007 adolescents age (10-19) residing permanently (at least for six months).

Study Participants

All adolescents living in Dilla town were source population; adolescents who live in randomly selected sub cities of Dilla town where study population and participants who were interviewed were study units (samples). In this study, the adolescent was defined according to the World Health organization in which participant with ages range 10-19 years (WHO) [28].

Sample size Determination and Sampling Procedure

The sample size was calculated using a single population proportion in which the proportion of suicidal ideation was14.3% taken from the study done in the Northwest part of Ethiopia (Dangila town) [26] and margin of error 0.03. Using 5% none- response rate, the final sample size was 550 adolescents. Study participants were taken through the multistage sampling technique. In the first stage, two sub-cities were selected randomly from the total three sub-cities. Then, from each selected sub-cities, 3 kebeles (the smallest administrative unit in Ethiopia) were selected by simple random sampling technique. Census was done to identify the actual numbers of adolescents in each kebele before data collection; sampling fame was prepared based on information obtained by survey. After equal allocation of the sample size in each kebele, participants were selected using systematic random sampling. The sampling interval (K) was determined by dividing the total number of households in each kebele by the sample size to be drawn from that kebele. The lottery method was used to select the first household between one and K. If there was more than one eligible adolescent in one house, we selected one using the lottery method.

Data Collection Procedures

The data was collected using a pre-tested interviewer administered questionnaire. The questionnaire was composed of socio-demographic, substance, level of social support, and mental distress- related factors. First, the questionnaire was prepared in English language and translated in to Gedeufa and Amharic (the local languages of the study area) and back translation was done by independent translators to check its consistency. Before the data collection, a pretest was carried out at Hawassa town among 5% of the sample size, and minor modification was made on the expressions of some questions to make them easy for understanding. Nine BSc level psychiatric nurses and Two MSc level mental health professionals were participated in the data collection after attending two days of training regarding the data collection procedures. Enumerators were recruited in each kebele until the expected participants were addressed. The principal investigator and field supervisors werechecked for its completeness.

Data collection tools and Measurements

The questionnaire has five components. Sociodemographic characteristics, substance-related factors, Oslo social support scale, mental distress questionnaire (SQR-20), and suicide-related questionnaires.

Social support was assessed using three item-Oslo-3 social support scales with ranges of scores poor=(3-8), moderate=(9-11), and strong=(12-14) [29]. Ever and current substance use were assessed according to the world health organization recommendation by contextualizing our study [30]. Self-reporting questionnaires (SRQ-20) were used to assess the presence of psychological stress (anxiety, depression, psychosomatic symptoms). The SRQ-20 has been tested in numerous settings and a cut-off point 7 was widely used, with the specificity of 83% and sensitivity of 89.5% [31].

The outcome variables (Suicidal ideation and attempt) were assessed by using the suicidality module of World Mental Health (WMH) survey initiative version 3.0 of the World Health Organization (WHO) composite international diagnostic interview (CIDI) which is validated in Ethiopia and found with good accuracy [32].

Data Analysis Procedure

Coded and checked data were entered into the computer using EPI Data version 3.1 and imported to statistical package for social science (SPSS) window software version 20. Descriptive statistics such as (frequency, percentage and mean) were computed and presented using tables and charts to show picture of the data. Bivariate binary logistic analysis was performed to determine each of explanatory variables and variables with p- value less than 0.2 during bivariate analysis were entered to multivariate analysis.

Multivariate binary logistic regression analysis was conducted to determine the presence of a statistically significant association between explanatory variables and outcome variables. Hosmerlemshow goodness model fitness was checked and its result was not significant statistically. Variables with P values less than 0.05 were considered statistically significant and strength of the association was presented by adjusted odds ratio with 95% CI.

Ethical consideration

The study was carried out after securing ethics approval from IRB of college of health sciences & medicine. Support letter was obtained from Gedeo zone health department. Data were collected after obtaining written consent from participants and parents were required to provide consent for participants under the age of 18 years. The information obtained was kept confidential during all stages of the study and used only for the study.

Results

Socio-demographic distribution of the respondents

About 517 study subjects were included in the study yielding 94% of the response rate. Among the respondents, the majority were in the age range of 16-19 years 382 (73.9%), about 276 (53.4%) were males. Of the total participants, 307 (59.4%) were protestant religious followers, and 299 (57.8%) were Gedeo in their ethnicity. The majority of the participants were single 434 (83.9%). The educational status of participants showed that; 289 (55.9%) of them attended primary level of education. Regarding occupation, 141 (27.3%) participants reported that they are daily laborer. The majority of respondent were living with their family member 441 (85.3%) (Table 1).

Psychosocial and Substance-related characteristics of the respondents

Regarding the psychosocial characteristics of the respondents, about 71 (13.7%) reported mental distress. Majority of respondents reported poor social support 246 (47.6%). Among participants, 86 (16.6%) had history of problematic alcohol use, 62 (12%) had history of current khat use and 29 (5.6%) of respondents had experience of current cigarette use within three months period (Table 2).

Table 1 Socio-demographic factors of adolescents living in Dilla town Gedeo zone Ethiopia, 2019 (n=517)

Variable	Category	Frequency (N=517)	Percent (%)
Age	10-15	135	26.1
	16-19	382	73.9
Sex	Male	276	53.4
	Female	241	46.6
Religion	Orthodox	146	28.2
	Muslim	58	11.2
	Protestant	307	59.4
	Others*	6	1.2
Marital status	Single	434	83.9
	Other**	83	16.1
Ethnicity	Gedeo	299	57.8
	Gurage	78	15.1
	Amhara	65	12.8
	Oromia	50	9.7
	Other***	25	4.8
Education status	Unable to read and write	20	3.9
	Abel to read and write	110	21.3
	1-8 grade	289	55.9
	8-12 grade	98	18.95
Occupational status	Student	134	25.9
	Daily labor	141	27.3
	Merchant	113	21.9
	Farmer	32	6.2
	Unemployed	73	14.1
	Other ***	24	4.6
Living status	With family	441	85.3
	Alone	76	14.7

Others*=wakefeta & no religion; **= married, divorced & widowed; ***=gurage, wolita, ****= hausewife and gov'employee.

Table 2 Description of psychosocial and Substance-related factors among adolescents in Dilla town, Gedeo zone, Ethiopia, 2019 (n=517)

Variables	Category	Frequency	Percent (%)
Stress	No stress	446	86.3
	Have stress	71	13.7
Social support	Poor social support	246	47.6
	Moderate social support	205	39.65
	Strong social support	66	12.76
Alcohol	No problem	431	83.4
	Problem	86	16.6
Life time use of Khat	Yes	150	29.0
	No	367	71.0
Life time use of Cigarette	Yes	43	9.9
	No	466	90.1
Current use of Khat	Yes	62	12
	No	455	88
Current use of Cigarette	Yes	29	5.6
	No	485	94.4

Magnitude of Suicidal Ideation and Attempt among adolescents

Life time Suicidal ideation was reported by 64 (12.4%) of adolescents with (95% CI, 9.3-14.9) Majority of participants with suicidal ideation were females 45 (70.3%). The life time prevalence of suicidal attempts among participants was 37 (7.2%) with (95% CI, 5.0-9.5). Among those who attempted suicide 29 (5.6%) had a plan before their attempt. The most commonly used method of an attempt was poisoning 18 (48.6%) followed by hanging 8 (21.6%). More than half of suicidal attempters 24 (64.8%) reported that; their suicidal attempt was related to conflict with their family (Table 3).

Table 3 Frequencies of suicidal ideation and attempt among adolescents in Dilla town, Gedeo zone, 2019

Variables	Category	Frequency	Percent (%)
Ever suicidal ideation	Yes	64	12.4
	No	453	87.6
Ever plan of suicide	Yes	29	5.6
	No	487	94.4
Ever suicide attempt	Yes	37	7.2
	No	480	92.8
Reason for suicidal attempt	Family conflict	24	64.8
	Economic problem	2	5.4
	Puberty	4	10.8
	Medical illness	1	2.7
	Death of family	6	16.2
Methods of attempt	Hanging	8	21.6
	Jumping from high place	2	5.4
	Poisoning	18	48.6
	Sharp tools	5	13.5
	Other	4	10.8

Factors associated with Suicidal Ideation among Adolescence

In bivariate logistic regression analysis, being female, living alone, being stressed, having poor social support, recent and life time khat chewing show p-value <0.2. These variables were the candidates for multivariate binary logistic regression. Being female, having stress, and life time khat use retains statistical significant association with suicidal ideation at p-value <0.05

The odds of having suicidal ideation among female participants was 3.56 times higher as compared with counter groups (AOR=3.56, 95% CI, 1.89, 6.69).

Participants who were having stress were 4.36 times more likely to have suicidal ideation as compared with respondents who have no stress (AOR=4.36, 95% CI, 2.30, 8.24). The odds of having suicidal ideation among respondents with life time use of khat was 2.81 times higher as compared to non-users (AOR=2.81, 95% CI, 1.49, 5.29) (Table 4).

Table 4 Logistic regression analysis of associated factors with suicidal ideation among adolescents in Dilla town, Gedeo zone Ethiopia, 2019 (N=517)

Explanatory variables	Suicidal Ideation		COR, (95% CI)	AOR, (95% CI)
	Yes	No		
Sex				
Male	19	257	1	1
Female	45	169	3.11 (1.76,5.48)	3.56 (1.89, 6.69)**
Living status				
With family	53	388	1	1
Alone	11	65	1.24 (0.62, 2.5)	1.42 (0.65, 3.11)
Stress				
Yes	23	48	4.733 (2.62,8.55)	4.36 (2.30, 8.24)**
No	41	405	1	1
Life time use of Khat				
Yes	34	116	3.3 (1.93, 5.62)	2.81 (1.49, 5.29)**
No	30	337	1	1
Current use of khat				
Yes	14	50	2.36 (1.22, 4.59)	1.7 (0.74, 3.91)
No	48	405	1	1
Social support				
Poor	30	216	1.01 (0.44, 2.3)	0.96 (0.39, 2.40)
Moderate	26	178	1.06 (0.45, 2.47)	1.08 (0.43, 2.70)
Strong	8	59	1	1

*=P- value <0.01, **=P-value <0.05 and 1= references groups

Factors associated with Suicidal Attempt among Adolescence

In binary logistic regression analysis, being female, living alone, having mental stress, having poor social support, recent and life time use of khat shows p-value <0.2. These variables were the candidates for multivariate logistic regression model but poor social support, current use of khat,and having mental stress were retained statistical significant association with suicidal attempt at p-value <0.05.

The odds of having suicidal attempt among respondents with mental distress was 4.26 times higher as compared to counter parts (AOR=4.26, 95% CI, 1.89,9.60). The respondents with current time use of khat were 7.7 more likely to have suicidal attempt than non-users (AOR=7.7, 95% CI, 3.12, 19.0).

Additional variable associated with suicidal attempt was having poor social support. The odds of having suicidal attempt among adolescents with poor social support were 4.75 times higher as compared to the participants with strong social support (AOR, 4.75, 95% CI, 1.02, 21.59) (Table 5).

Table 5 Logistic regression analysis of associated factors with suicidal attempt among adolescences in Dilla town, Gedeo zone, Ethiopia, 2019 (n=517)

Explanatory variables	Suicidal Attempt		COR, (95% CI)	AOR, (95% CI)
	Yes	No		
Sex				
Male	21	255	1.6 (0.60,2.27)	1.04 (0.48, 2.24)
Female	16	225	1	1
Living status				
With family	30	411	1	1
Alone	7	69	1.39 (0.58, 3.29)	1.46 (0.53, 4.06)
Stress				
Yes	15	56	5.16 (2.53, 10.53)	4.26 (1.89,9.60)**
No	22	424	1	1
Current time use of khat				
Yes	14	8	5.48 (2.65, 11.35)	7.7 (3.12,19.0)**
No	23	432	1	1
Social support				
Poor	32	214	4.79 (1.12, 20.51)	4.75 (1.02, 21.59)*
Moderate	3	202	0.32 (0.04, 2.30)	0.23 (0.03, 1.75)
Strong	2	64	1	1

*=P-value <0.01, **=P-value <0.05 and 1=references groups

Discussion

In this study, the prevalence of suicidal ideation was 12.4% with (95% CI, 9.3-14.9). The magnitude of our study's finding was consistent with a systematic study conducted in 32 low and middle-income countries that the 12-month prevalence of suicidal ideation was 12% among males [33]. The pooled prevalence of life time suicidal ideation in USA was also 22.3%, which is higher than prevalence of suicidal ideation in our study [34]. However, the prevalence of suicidal ideation in current study was lower than cross sectional study conducted in Gondar, Ethiopia among university students 19.9% [24], study conducted in Dangilla town among 573 participants with the prevalence of suicidal ideation 22.5% [26] and study conduct in Ghana 18.2% [35].

The possible reasons for the difference might be due to difference in studies designs used and sample size as well as variation of the study population. In addition, it might be also due to variation of study setting, in which a previous study from Gondar was conducted among students who might face academic and environmental difficulties while they were assigned to different activities in the university. Differences in time of study might be also another possible reason for the discrepancy.

The magnitude of suicidal attempts in the current study was 7.2%, with (95% CI, 5.0-9.5) which is almost similar to the study conducted in Poland, about 4.37% of the participated adolescents reported suicidal attempts [36]. However, the finding of this study was higher than studies conducted in USA 1.2% [34]. On the other hand, the prevalence of suicide attempt in our study was lower than cross-sectional study done in Ghana 22.2% [35]. The discrepancy might be due to variation in study design, which was prospective study design in USA [34]. The difference in sociocultural, settings and sample size might be other possible reasons for the inconsistency of findings.

Regarding factors associated with suicidal

ideation, being female, participants who have mental distress and life time khat users were highly influenced by suicidal ideation. This was supported by cross-sectional study conducted in Gondar among university students that mental distress and khat chewing were significantly associated with suicidal ideation [24]. The possible reason might be due to the impact of chewing on brain and different organ systems. Khat chewing has also negative effect on economic aspects of chewers, which is distressing to survive life, particularly in developing countries. literatures also showed that khat has a direct effect to mental illness like suicidal ideation, aggression and anxiety [37]. A study conducted in Nepal among adolescents also concludes that anxiety (stress), loneliness, in security were significantly associated with suicidal ideation [38]. On the other hand, being female was more prone for suicidal ideation. The possible explanation may be the fact that depression (the predisposing factor of suicide) is more prevalent among females [39].

Concerning suicidal attempt, being mentally distressed was four times more likely to have suicidal attempt. this was in agreement with a cross-sectional study conducted in Jamaica showed that stress was positively associated with suicidal attempt [40]. In addition, suicidal attempt is not always a planned action which means that emotional disturbances might be precipitating it.

The other strongly associated factor with suicidal attempt was current khat chewing. According, adolescents who chew khat currently were eight times more likely to have suicidal attempt than non-chewers. This is consistent with cross sectional survey in Poland, suicidal attempt correlates intake of psycho active substances like khat and cigarette [36]. Participants with poor social support were also more prone for suicidal attempt as compared with their counter parts and this finding was supported by study conducted among students in Gondar, Ethiopia [24]. Social support is important for psychological adjustment and individuals who have poor social support may think difficulty to adjust to psychological problem by themselves and feeling alone may lead to suicidal attempts [41].

Limitation of the study

There were potential limitation for our study. Firstly, design cannot allow establishing a temporal relationship between suicidal ideation, attempt, and significant associated factors. Secondly, only limited variables were candidate to multivariable analysis, while doing bivariate binary logistic regression. Thirdly, since data collection was interview method, it might face recalling problem of some symptoms.

Conclusion

In this study, the magnitude of suicidal ideation and attempt were high as compared to general population. Both suicidal ideation and attempt had statistically significant association with mental distress. Being female participant and life time khat chewing is significantly associated with suicidal ideation but having poor social support and current khat chewing were significantly associated with suicidal attempt. Understanding the determinants of suicide in the leaders of tomorrow adolescents is a critical step towards development of the health system and health. It is better to focus on improving social relationships throughout adolescence by sex and living status. Gedeo zonal health office should work on the risk factors of suicide among adolescents, like khat chewing.

Assertions

Consent for Publication: Not applicable

Competing Interest

The authors declare that they have no conflicts of interest.

Availability of data and materials

All the data included in the manuscript can be accessed from the corresponding author through the email address alexmolla09@gmail.com.

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Authors' Contributions

SD & DA wrote the proposal, participated in data analysis; write up of the paper. AM, YB & BM Participated in data analysis and revised subsequent drafts of the paper and was involved in manuscript writing. All authors read and approved the final manuscript.

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RESEARCH ARTICLE

Effect of Mothers' Migration to Arab Countries on The health of Families Left Behind in Butajira, Ethiopia: A qualitative study of lived husbands' experiences

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Abstract

Background: Despite the primary motive of migration which is to improve the living standard of a family at the place of origin, little is known about the effect of mothers' migration to Arab countries on the health of families left behind. Ethiopia is one of the counties where females' migration to Arab countries is highly a trend. This study is aimed at qualitatively exploring the effects of mothers' migration to Arab countries on the health of families left behind in Butajira, Ethiopia.

Methods: Descriptive, phenomenological approach has been used in this study. The purposive sampling strategy was employed based on wanting to interview people who have lived experience with the research questions. Both primary and secondary sources of data were used. Seven interviews were conducted and the thematic analysis method was done using atlas.ti qualitative analysis software.

Result: This study explored that mothers' migration to Arab countries has improved the livelihood of left-behind families. But husbands of the migrant woman were inefficient in their main work, stressed by household management, susceptible to HIV, and addicted to various substances. In addition, young children faced different incidents including illness, difficulty in keeping their hygiene, and getting nutritional food on time. Furthermore, they were abandoned and faced a range of accidents like poisoning, drowning, and submersion. Similarly, older children also faced sexual assault from their families, decreased performances in education or/and dropout from school to care for younger siblings or contribute to household labor.

Conclusion and Recommendations: Mothers' migration to Arab countries contributes positive and negative impacts on the health of families left behind. In this study, the negative effect is more pronounced than the positive one because it could be compensated by remittance. To minimize the effect during mothers' migration, providing education and support to left-behind families on household work management, child care, HIV/AIDS, gender violence at community levels could be essential. Moreover, retaining mothers in their local community by supporting and creating jobs would alleviate the overall negative impacts.

Keywords: Butajira, Health, Migration

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Background

Individuals might move as part of their effort to improve their lives and the lives of their families, learn new skills, gain new experiences, find jobs or flee insecurity, disaster, or famine [1]. Throughout the developing world, rural households who are unable to sustain themselves using local resources are more prone to utilize migration as a source of self-development [2].

In Ethiopia, migrations as a result of low job opportunities, poor living conditions, and surplus labor are often seen as a form of household income diversification [3]. The trend is usually some household members migrate to areas with better opportunities while other household members stay at their original location and benefit from the migrants (ibid).

The number of African women leaving their countries either as autonomous or dependent migrants to undertake domestic work is increasing [4]. According to the International Labor Organization, women migrate as much as men, as they represent almost half (48 percent) of all international migrants (224 million) in 2015 [4].

Historically Ethiopian women started to migrate to the Middle East countries as domestic workers in the late 1990s, primarily to Lebanon [5]. Their flow began to increase in the 2000s. It was reported that in 2011, a total of 40,419 Ethiopians went abroad to be employed in elementary occupations, such as domestic work [6]. From this number more than 95% of these individuals were women who migrated to the Middle East (most likely for domestic work), the top two destinations being Kuwait and Saudi Arabia (ibid). Moreover, another study conducted in 15 communities across five different regions of Ethiopia in 2011 showed that the Middle East was the primary destination for Ethiopian migrants [7].

At the place of origin has a migrant family member in an Arab country is seen as positive because he/she sends money to families as a remittance [8, 9]. This improves the family's income, household's nutritional requirement by having more food and enhancing their well-being [10]. Studies also showed that children of migrant households have better health than non-migrant households due to the use of remittances for their education and health needs [12]. Despite these economic benefits, if the migrant is a mother, that could hurt the growth of children. This is because children are more attached to their mother mainly at a younger age. At the same time, the absence of a mother could influence the roles played by children in and outside of the family [11, [12].

On the other hand, studies identified that parental migration has an impact on the mental and physical health, quality of care, medication, and feeding style of children [13- [16]. For example, a study conducted on students in rural China found that the annual injury rate among children left behind was more than twice that of children living with parents [16].

On the other side, studies showed that children of migrant parents were exposed to harmful consequences such as alcohol consumption, drug use, and sexual abuse. These were majorly related to the availability of pouch money given by migrant parents, peer pressure, and the absence of adequate supervision from parents [13, [15]. Moreover, parental migration also imposes psychological and socialization problems on children including over-load house works, anxiety, and loneliness [17]. These could result in lower academic achievement and school dropout [13, [15].

Studies have also found that separation from a spouse could change the husband's household role, cause depression and conflicting feelings such as dependency on the migrated member. These may lead to extramarital relations which in turn maximize health risks such as HIV/AIDS and other STDs [17, [18].

There are previous studies that were focused ontrend and determinants of migration in Butajira, but no study done before on the effect of mother migration on families left behind. Therefore, the present study explores the effect of mothers' migration to Arab countries on families left behind in Butajira, Ethiopia. This study is expected to

fill the knowledge gap and will serve as a base for implementing appropriate interventions.

Methods and Materials

Study approach, Data source, Study setting

In this study, a phenomenological approach was used since it helps to address the lived experiences of individuals. The study uses both primary and secondary sources of data. Interviews from selected husbands who have experience of living with their children by sending their wives to Arab countries were used as primary data sources. The primary data was collected from April 20-27, 2019.

Secondary information was obtained from the existing Butajira Rural Health Program surveillance data to identify migrant and/or returned mothers from the database. The Butajira Rural Health Program (BRHP) is one of the oldest demographic surveillance sites. It has conducted a census of the population in 1987 in sampled *Kebeles* to obtain the baseline population and establish a system of Demographic Surveillance Site with continuous registration of vital and migratory events at a household level [19]. The Surveillance *Kebeles* consists of nine rural and one urban peasant associations (PAs) which were selected based on probability proportionate to size technique [20]. Currently, BRHP has a population of 80,607 individuals comprising 14,347 households under surveillance. This study employed in-depth qualitative research methods in three Kebeles of the BRHP namely *Bati*, *Wurib*, and *Kebele* 04 in Butajira town.

Sampling technique

Mothers who have experience of migration to Arab countries were first selected from the BRHP database and their places of residence were identified from the database. The purposive sampling technique was used to identify the husbands of those mothers. Appointments for participants were made in advance to ensure that the interviewees were available and well prepared for the interview.

Data collection

Semi-structured questions were used to collect data. The data collection tool was first prepared in English then translated to the local language (Amharic). The interviews were conducted in a place chosen by the respondents that gave them the best possible privacy. A total of seven in-depth interviews were conducted among husbands of the migrant women where the saturation level reached. Each in-depth interview took 28 to 55 minutes to complete. The digital recording data were transcribed and then translated to English with careful edition.

Data analysis and interpretation

Atlas.ti qualitative analysis software was used for the analysis of the collected data and a thematic method was used for analysis. All interviews were read several times carefully to familiarize with the information and were coded independently. Then the coded data were grouped into three categories based on the informants' representation of the phenomena. Accordingly, the categories identified on the effect of mother migration to Arab countries were health, economic and psycho-social effects. These categories are considered themes for this study.

Ethical considerations

The interviewer aloud verbatim read the objective of the study and informed consent. All study participants consented to participate in the study and their consent was also requested to use a tape recorder during the interviews. Individual identifiers were removed during transcription to maintain the anonymity of information. Participants had the choice to participate or not to, and to withdraw from the study at any time if they wish to do. The records were kept in a locked place that only was accessible to the researchers. Finally, informed consent was taken from all participants through either a signature or thumbprint.

Results

Table 1 General information about in-depth interview participants and their families during mother migration

S. No.	Respondent's Code	Husband's Age	Level of Education	Duration of stay of Mothers' in Arab countries	Children's left at home		
					Number	Sex	Age (year)
1	01	38	Secondary (9-10)	2 years & 6 months	3	Female	10
						Female	7
						Male	3 & a $\frac{1}{2}$ year
2	02	30	Secondary (9-10)	4 years	1	Male	1 & a $\frac{1}{2}$ year
3	03	60	Illiterate	5 years & 2 months	3	Male	9
						Male	6
						Female	$\frac{1}{2}$ year
4	04	33	Primary (5-8)	15 years	1	Male	3
5	05	28	Primary (5-8)	1 & 6 months	2	Male	7
						Female	1 & a $\frac{1}{2}$ year
6	06	26	Primary (1-4)	2 years	1	Male	2
7	07	30	Primary (5-8)	3 years	3	Female	6
						Male	3
						Male	2

Table 1 indicates characteristics of families at the time of mother migration and duration of stay in Arab countries. It can be seen that the highest number of children left at home with their fathers were 3 while the smallest number was one. The mother left a baby as young as 6 months which was the smallest age recorded while migrating to Arab countries. The highest duration of stay in Arab countries was 15 years and the smallest was 2 years.

Health effect of mother migration to Arab countries on families left behind

Children's Health: Incidence of illness

The health effect was one of the problems observed during mothers' migration on the left children at home country. The results showed that the majority of husbands were responsible for taking care of the youngest children at home. However, whatever care they gave for their children they could not satisfy their needs as their mother. Because mothers spent most of their time with children, they can easily understand their problems earlier than their father can. Respondent code 06, age 26, expressed the effect of mother migration on child health as:

> "*I reached for my children after they become seriously ill because we do not have a chance to stay together for a longer time as I will be out for work.*"

Almost all respondents assured their children were seriously sick at least once when their mother was absent. Children also did risky actions like sleeping in the agricultural field due to the absence of follow-up from their caregivers. For example, a father of 1 and a half years' baby said:

> "*I saw my child sleeping in an agricultural field. It was a sunny day, and she was in a deep sleep. I knew that there were snakes and different insects in the field. I thought that if her mother did not go to Arab countries, my child would not suffer like this.*"

Moreover, older daughters in the household faced serious health problems when their mothers migrated to Arab countries. As Respondent code 04 said:

"*There was one case in other Kebele that I heard it. A mother left two children with their father and went to Arab countries. After 15 days father raped his 12 years old daughter. He did this at different times, and she became very ill. Then their neighbors' heard while she was crying and brought her to the hospital. She was treated in the hospital for a longer time.*"

This study also highlighted that children would face different health problems when they sent to their siblings due to their mother's migration to Arab countries. For example respondent code 01 said:

"*I sent my ten years old daughter to her aunt and she performed all the household works until midnight, fetch and carry 20 liters of water by herself. One day she falls while carrying the water and fainted out. They bring her to the hospital and get treated. But the pain is still there after one year.*"

Children's Health: Personal Hygiene

In this study, it is identified that mothers' migration to Arab countries affects children's hygiene. Interviewed participants explained that they did not get any support from their families or societies after their mother migrated to Arab countries. Furthermore, they indicated that they become responsible for the overall duties related to their families. For example, a 60 years old father explained his experience as:

"*It is me who takes care of children's hygiene. Even I was not able to wear my trouser properly. I wrap it up to my thigh and make it like shorts and then I wash their body, their clothes, and yes, I was taking care of their hygiene properly.*"

Most of the respondents described the presence of personal hygiene management differences between children whose mothers migrated to Arab countries and those children who live with their mothers. For example, a 30 years

"*Those children who have their mothers here wear clean clothes and they get a bath every time. But my child did not get our full protection. But if she (my wife) was here, she would have washed him every time.*"

Children's Health: Extent of care and Injury

Mother's migration to Arab countries results in a lack of appropriate care for children and leads to the occurrence of different accidents like poisoning, burning, and submersion. Half of the study participants reported that their children faced serious accidents due to the absence of their respective wives at home. One of the respondents (code 05) explained the accident that his one-year-old daughter faced as:

"*One day we prepared poisoned food for a rat in the house. Then in the next day my daughter's body becomes swollen, it was because she touched or smelled the poison.*"

In addition, a 30 years old father described the accident that his one and a half years old child encountered as:

"*One day, after his mother left, the child touched pitcher boiling water on the fire, and the hot water spilled over him and he got burned I took him to a health station immediately and get treated. His injury was serious. Because of that, I felt that it would not have happened if his mother was here.*"

Children's Health: Nutritional status and availability of food

This study also assessed and identified if there were difficulties in preparing nutritionally rich foods for children in the house when their mothers migrate to Arab countries. A father of 2 children, aged 7 and 18 months explained:

"*I could not prepare nutritionally rich food for my oldest daughter that she will take to school for her lunch.*"

The majority of the interviewed participants confirmed the absence of food varieties in their

house compared to the time when their wives were with them. On the other hand, it was observed that mothers' migration to Arab countries affects the availability and intake of food among children. Food availability and feeding time of younger children were also dependent on the existence of their father or older siblings in the household. One of the respondents (code 01) stated:

> "*Children mainly eat breakfast early in the morning. Later, if my eldest daughter cooks something without being destructed by her friends, they will eat around 3:00 pm. If there is nothing prepared, they have to wait until something is cooked.*"

While explaining the impact of mother's migration on children's feeding time, a 30 years old man who is a father of 3 children said:

> "*Sometimes, children play outside for the whole day without coming back home for lunch, because no one is there to follow them like their mother.*"

Substance use and addiction

Mothers' migration to Arab Countries showed an impact on substance use and addiction such as chewing Khat and smoking cigarettes by husbands. All husbands interviewed for this study were chewing Khat before their wives left for Arab countries, and were never addicted to alcohol or smoking cigarettes. Some respondents indicated that their wives' migration affects the amount of Khat they use per day while some implied that they even stopped chewing Khat due to high household expenses. On the other hand, other husbands showed an increase in the amount of Khat they chew per day and faced confusion to define their living. One of the respondents who started smoking when his wife was not around indicated that he quit smoking upon her return. A 30 years old husband whose wife lived for 15 years in Arab countries said:

> "*I started smoking cigarettes. When I was thinking about her, I use smoking as a mechanism to forget her.*"

HIV/AIDS

Interviewed participants also discussed the possible impact of HIV on their wives who migrated to Arab countries. They suspect that their wives would face sexual harassment from their employers and could get HIV. Most of them were unstable and felt insecure about their wife's HIV status while they are in Arab countries. They also indicated that they discussed the issue and concern with their wives while they were in Arab countries. For example, the respondent (code 05) said:

> "*I was discussing HIV with my wife when she was there. And I always ask her what will happen if one of us get infected with HIV. But Allah saved me from this problem.*"

After their wives comes back from Arab countries, all husbands were tested for HIV together with their wives. But they were tested at different times after their wives' arrival. In line with this, the respondent (code 05) explained his experience as:

> "*Most men in our community suspect their wives could be related to HIV. And they lived together for some time after they returned, then they went to a clinic and tested.*"

Moreover, respondent code 01 shared his experience of testing for HIV as follows:

> "*My case is a little different. You know the first time she arrived, we went to Butajira town after putting our luggage with our relatives. We did not directly go home. We had our checkup. When they called from home, I told them that she did not arrive yet and I am waiting for her in Addis. Then, we have got our results and stayed in Butajira with relatives and went back home the next day. The result was great. I used to recommend this thing for many people, but they do not change it into practice.*"

Economic effect of mother migration to Arab countries on families left behind

Use of remittance

The result of the study showed that all mothers who migrated to Arab countries support

their families by sending money and hence, most families do not lack money. All husbands interviewed described that they spend the money they receive only for purchasing or constructing different assets in their communities or urban areas. In line with this, a respondent code 01 explained:

> "*We do not use the money for another purpose. Since I knew that she made the money through hard-working, I rather used to save it. I even build a house for her, bought land and water pump.*"

They also explained that they use the remaining money for household expenses including food, clothes, and school-related fees.

Husband's work

In the study area, it was depicted that activities such as child care, house and backyard keeping, and cooking are considered mothers' responsibilities. In contrast, husbands are primarily responsible for agricultural activities. However, mothers' migration to Arab countries forces husbands to take the overall responsibilities including the role of their wives. Most husbands responded that they were not efficient to accomplish all activities and expressed that they did not expect these many difficulties and burdens to accomplish their wives' roles following their migration to Arab countries. As respondent code 04 said:

> "*It is me who does all the household activities; I even could not do my job outside the home. I stayed home, I also left my job.*"

The respondents indicated that the time required for household activities and child care was one of the main reasons for leaving his job. With this aspect, a respondent (code 02) described his experience as:

> "*The baby could not eat any other thing and I should boil him rice, wash him, let him sleep and when he wakes up, I should feed him. I could not do all these things if I did not stay in the house. So it was my responsibility to do all this and that dragged my work in the farm.*"

Psycho-Social effect of mother migration to Arab countries on families left behind

Psychology of Husbands and children

Mothers' migration was found to have psychological effects on the husbands' mainly when they are stressed and miss their wives. The husbands indicated that they had various psychological and emotional feelings including loneliness, sadness, anger, insecurity, confusion, and madness. In addition, children continuously ask where their mothers did go and when they will return home. Due to this, the majority of the participants regret the decision they made to let their wives migrate to Arab countries. For example, respondent code 01 said:

> "*My children used to say "bring our mother, it is you, who sent her to Arab, away from us. "And another time they will say to me: "when will she come back?". I used to tell them: "She will be back with money." My youngest son used to cry saying "my mother". During that time, I also used to feel miserable and cry with him. When I look at it, it is wrong that she went away think the economy; however, it is a lot we missed while she is away. A mother shouldn't leave no matter what!.*"

Respondent code 02 described his feelings as:

> "*After she left, I feel angry every time I hear airplane's sound. I curse the day I saw her off and blame our poverty.*"

On the other hand, husbands were more stressed and busy with household chores. In addition, they felt frustrated to bring visible changes in the way of their living before their wives return. The psychological effect of mothers' migration on children is also explained concerning their new feeling or action. Children of migrant mothers were found to feel lonely, and express their feelings by crying mostly while calling their mothers. As respondent code 02 said:

> "*My baby had been feeling lonely. When he sees mothers care for others, he would feel lonely. He would tell me what the children's mothers did for their children.*"

Children's education and responsibility

The impact of mothers' migration on children's education and responsibilities was also assessed. In the study area, children showed poor performances in their education following their mothers' migration to Arab countries. Factors including shared responsibilities and the time they spend taking care of their younger siblings, preparing food, washing clothes, and housekeeping contributed to their poor performances in academia. In line with this respondent code 01 said:

> "*Before their mother left, they used to get the highest rank; like from 1st to 5th level out of 70 students in their classroom. After she left, their rank become like 37, 38 out of 70 students. They stopped those activities they used to practice while she was around like; There was a study time after school after 3:00 pm. Their study after school that they used to do by sitting under the tree has been stopped.*"

On the other hand, respondent code 01 said his wife trained their oldest daughter about household work when she started planning to migrate to Arab countries. The study explored that elder children who are at the age of 6 or older were responsible to carry out all household activities. In support of this respondent code 03 said:

> "*When she was here they have been learning but after she left I let them stay at home because I had no one to help me with the housework.*"

In the study area, it was also indicated that elder siblings' drop out from school brought a similar effect on younger children following mothers' migration to Arab countries. For example, respondent code 01 said:

> "*The other kids in the household say you made her (the eldest daughter) to leave school and you want us to go "We don't want to go!" Even when I asked the kids about education, they usually told me if they went to class or not, as well as about their attendance.*"

In addition to household work, the oldest daughter in this study area also left her education due to sexual abuse they faced from her father.

Socialization of husbands

All interview participants reported that their wives' migration has limited the social interaction and responsibilities they have with friends and the community. They showed that child care responsibilities and lack of community acceptance contributed to such effects. In line with this, respondent code 01 explained how he manages social gatherings and responsibilities as:

> "*I quickly leave from places like that. The people understand me; they say "He has children to take care of". This is because I know that once my kids are at sleep they don't wake up even if a beast comes and drags them. Thus I go to such places, even though I can't stay late as usual.*"

On the other hand, a 60 years old father who is taking care of his 6 months old baby described his experience as:

> "*For the past 5 years, I never had coffee in anyone's house. Because all of them had hated me, I would not go.*"

Marriage stability

The effect of mothers' migration to Arab countries on the stability of existing marriage was discussed with all interview participants. All interviewees reported that they did not face challenges to keep their marriage until the return of their wives. However, they indicated that they felt uncomfortable during those times and also faced peer and family pressures to start new relationships. The respondents said that their children might not let them engage with another woman. In addition, they fear that their wives could hear from other people including their own families regarding their new relationship status and hence, prefer to be loyal to their existing marriage. In line with this, respondent code 01 explained his experience as:

> "*After she left I couldn't get closer to anyone especially with women unless the woman is a relative. You know, even when I sell cabbage,*

many women come from far areas to purchase the cabbage. Because I know what can be said to my wife by some of them, I just ask what they need; I go to the garden and send the cabbage by one of my children, asking them to bring the money too."

Discussion

In the study area, several impacts were observed on husbands and children who are left behind. This finding showed that mothers' migration to Arab countries is considered as a major source of income that could bring economic change in a family. It was indicated that migrated women and mothers send money regularly to help their families. Besides, husbands are responsible to use the money they receive and improve the living conditions of their respective families. It was observed that husbands use remittance mainly to build modern houses and to purchase farmlands and equipment. In addition, household and daily expenses including food, education, and health are also covered from the money they receive. Recent reviews suggested that families receiving international remittances spend less money on consumption goods such as food and more on investment goods including education and housing. Also, they are found to invest more in entrepreneurial activities [8, [9]. Therefore, it can be concluded that remittances can cover daily household expenses and improve the economy of one's family by improving investments.

Previous findings carried out in this study area, Butajira, Ethiopia, showed that activities including child care and other family members, housekeeping, cooking, and generating supplementary income are considered as the role of women. Comparably, men are primarily responsible for earning income largely from agricultural farming [21]. In this study, following their migration to Arab countries, it was found that the mothers' responsibilities were majorly shared by husbands and elderly children. A similar study in Vietnam showed a comparable result and indicated that fathers were the most important caregivers to their children following mothers' migration [22]. In contrast, a previous study conducted in Sri Lanka and the Philippines showed that female relatives were the most important caregivers [12].On the other hand, the present study found that mothers' migration made husbands limit their responsibilities and activities in their community. In addition, it made them worry and question their efficiency in household management and their overall work. In line with this, the study conducted in Vietnam also found that fathers were initially worried to take mothers' work on top of their usual paid work and that made their life rather challenging at least for the first there months [22]. Our study also found that husbands were experiencing stress following their wives' absence and hence, increased the amount of Khat they chew per day and also started smoking cigarettes to overcome the stress. It was indicated that such behavioral changes among husbands could affect their health and weaken their household responsibilities [23].

It was also found that fathers were not trained enough and ready to accomplish household tasks and stay with children at home for a longer time like their mothers. In addition, the study revealed that elderly children who spend most of their time on household activities lacked cleanness and proper hygiene and faced different difficulties such as illness, poisoning, drowning, and submersion. Other studies also indicated that children faced various circumstances like malnutrition due to sudden termination of breastfeeding, accidents due to lack of attention, and morbidity following their mothers' migration [24, [25]. In contrast, other studies depicted that mothers' migration is a good source of income for left-behind families. However, the income alone could not solve the problem that older children face such as child care, cooking a variety of nutritional foods, and housekeeping due to their low experience and capacity [26-[28].

Also, in the present study, older children were found to share most of the household activities next to their fathers. Comparable studies showed that older children take inappropriate responsibilities that were beyond their capacities and faced anxiety, loneliness, and other psy-

chological and social problems following their mothers' migration. Also, mothers' migration influenced the regular school attendance and educational performance of older children and experienced family pressure to quit school until the return of their mothers [13, [15, [17, [24]. Studies also revealed that older female children faced sexual abuse and/or rape from their fathers and encountered different health problems following their mothers' absence [12, [24, [27].

The return of migrated mothers could also affect families' health. Previous studies revealed the impact of mother migration on HIV transmission to the families left behind following their return. Migrant women from three Asian countries were found to engage in consensual or non-consensual sexual relationships during their stay in Arab countries. It was indicated that economical and psychological factors including loneliness, insecurity, and homesickness contributed to such sexual relationships. In addition, sexual harassment and rape from employers and strangers were reported as contributing factors [29]. In this study, husbands were found to have basic knowledge about HIV and suspect that their wives could face similar circumstances during their stay. However, most husbands did not take immediate HIV tests upon the return of their wives from Arab countries. Hence, it can be predicted that such time lag could make them easily susceptible to the disease.

Conclusions and Recommendations

The present study assessed the effect of mothers' migration to Arab countries on families in Butajira, Ethiopia based on the experiences of left behind husbands. It can be concluded that mothers' migration has a significant role in poverty reduction and improved livelihood to families. However, our study found that the negative impacts of mothers' migration could not be compensated by remittances and were found to dominate over the positive effects on the families left behind in Butajira. Hence, Providing education and support for left-behind families on household work management, child care, HIV/AIDS, and gender violence at the community level would be important. In addition, creating local employment opportunities for mothers in their local area, providing follow up by health extension workers for the left- behind children regarding the signs and symptoms of different diseases will help to ensure the families health-seeking behavior and care attendance.

Assertions

Consent for Publication: Not applicable

Competing Interest

The authors declare that they have no conflict of interest.

Availability of data and materials

The datasets used/or analyzed during the current study is available from the corresponding author on reasonable request.

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Authors' contributions

ET participated in the coordination of the study, performed the data analyses, and drafted the manuscript. ET, RT, MM conceived the study, participated in its design and coordination, and helped to draft the manuscript. All authors read and approved the final manuscript.

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RESEARCH ARTICLE

Early Neonatal Death and Associated Factors Among Babies Born in North Shoa, Ethiopia

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Abstract

Background: Early neonatal death refers to the death of a newborn within the first seven days of life or with a birth weight of at least one kilogram. It is a key indicator of the quality of prenatal, intrapartum, and newborn care, and remains a major contributor to under-five mortality. In Ethiopia, few studies have examined early neonatal deaths, and most existing research relies on secondary, institution-based data. This study aims to provide insights into early neonatal mortality within rural communities of Ethiopia.

Methods: A community-based cross-sectional study was carried out in rural areas of the North Shoa Zone between January 1 and March 30, 2020. Data were entered using EpiData (version 4.2) and analyzed with SPSS (version 23). Variables with a p-value < 0.25 in bivariable analysis were included in multivariable logistic regression to adjust for potential confounders. Both crude and adjusted odds ratios (AOR) with 95% confidence intervals (CI) were calculated to assess associations between dependent and independent variables. Statistical significance was set at $p \leq 0.05$.

Result: The magnitude of Early neonatal death was 9(9.4%) (95%, CI: 7%-11%). Maternal age less than 18 years, mothers unable to read and write, gestational age less than 37 weeks, unable to cry immediately after delivery, and the short inter-pregnancy interval was significantly associated with early neonatal death.

Conclusion: Generally, this study has high early neonatal death, which needs more attention. Maternal age less than 18 years, mothers unable to read and write, gestational age less than 37 weeks, unable to cry immediately after delivery, and the short inter-pregnancy interval was significantly associated with early neonatal death.

Keywords: Ethiopia, Neonatal death, Newborn, Oromia, Still birth

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Background

Early neonatal death is defined as the death of a newborn between zero and seven days after birth [1]. The early neonatal period is the most vulnerable time of life, with the highest mortality rate compared to any other time [2, 3]. Key contributing factors include mode of delivery, preterm birth (<37 weeks), low Apgar score, birth asphyxia, traumatic delivery, and inadequate maternal care during pregnancy, labor, and delivery. Early neonatal death serves as a key indicator of the quality of prenatal, intrapartum, and newborn care. It is influenced by multiple determinants that must be carefully assessed before drawing conclusions about care standards [10-12].

Numerous maternal and fetal variables, as well as institutional factors, have an impact on newborn mortality. Congenital malformations, male fetus, multiple parties, premature cesarean birth, hypoxia, and pregnancy-related hypertension are among more variables that might lead to a nearly fatal newborn outcome [4, 5].

Globally, every year an estimated 4 million babies die in the first four weeks of life (the neonatal period), with the highest risk of death being on the first day of life [6]. Early neonatal death represents 73% of all postnatal deaths worldwide. Despite a 50% reduction in childhood mortality, the reduction of ENND has significantly lagged behind other Millennium Developmental Goal achievements and is a growing contributor to overall mortality in children aged <5 years [1, 7].

Globally, in 2015, among 5.9 million child deaths, nearly 2 million deaths occurred in the first week of life (early neonatal period) [8] the highest rates are generally in sub-Saharan Africa [6, 9], where almost all (99%) neonatal deaths arise in low-income and middle-income countries [6]. The reduction rate of neonatal deaths between 1990 and 2015 in low and middle-income countries is 5.3% (from 5.1 million to 2.7 million), which is slower than that of post-neonatal and under-five mortality in which 47 % and 58 % child death worldwide, respectively [10].

In 2015, maternal complications in labour carried a high risk of neonatal death, and poverty is strongly associated with an increased risk [11] and it is significantly higher among low birth weight and preterm births. Nearly 1/3rd of death occurred on the 1st day or within 24 hours of life [12-14].

A significant change has been made to reduce child mortality, but the rate of decline in neonatal mortality is slower (49 to 29 death per1000 live births) due to high neonatal mortality [15]. In 2015 neonatal mortality rate was 28 per 1000 live births (87,410), and early neonatal death contributes more than 3/4th of total neonatal death [16]. The change in neonatal death is still stagnant and needs attention in rural and urban communities.

Despite the existing research regarding perinatal death neonatal deaths, there is limited understanding of the factors associated with early neonatal death in north Shoa, Oromia region. Little attention has been given to examining specific factors that impact early neonatal death.

Early neonatal death contributes to more than 3/4th of total neonatal death [14]. The change in neonatal death is still stagnant and needs attention in rural and urban communities.

This study may provide information about early neonatal death in rural communities of Ethiopia, which contributes to sustainable development program engagement, action, and partnership by all countries to reduce neonatal mortality by 12 or fewer by 2030 using primary data than secondary data about the problem.

Methods and Materials

The Study Area. Period and Design

A community-based cross-sectional study was conducted in North Shoa Zone from January one to March 30, 2020, which is bordered on the South by Oromia special zone surrounding Addis Ababa, on the southwest by West Shewa on the north Amhara region and southeast by East Shewa.

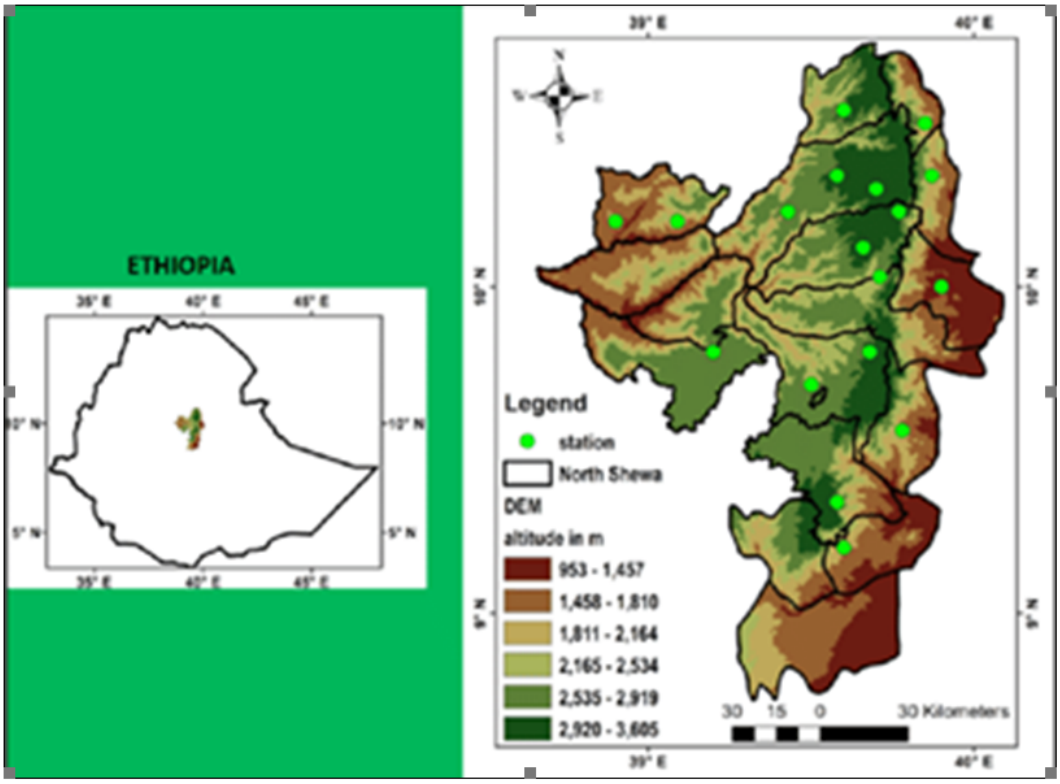


Figure 1 Map of the study area

The total population in the Zone is 1431305, 717552 male and female, respectively [17, 18]. The Zone has 14 woredas, which have three hospitals that currently give service (one general and two primaries) and 52 health centers.

According to 2017 zonal health statistics data, around 18350 women give birth annually in hospitals, health centers, and health posts [18]. The zone is found under the Oromia regional state and divided into 18 districts. Among these, five districts' mothers residing in the Kebeles were included in this study.

Population

Source population

All mothers who gave live birth within North Shoa, Oromia, Ethiopia, were the source population of this study.

Study population

All mothers who gave live birth within the last month before the data collection period were the population of this study.

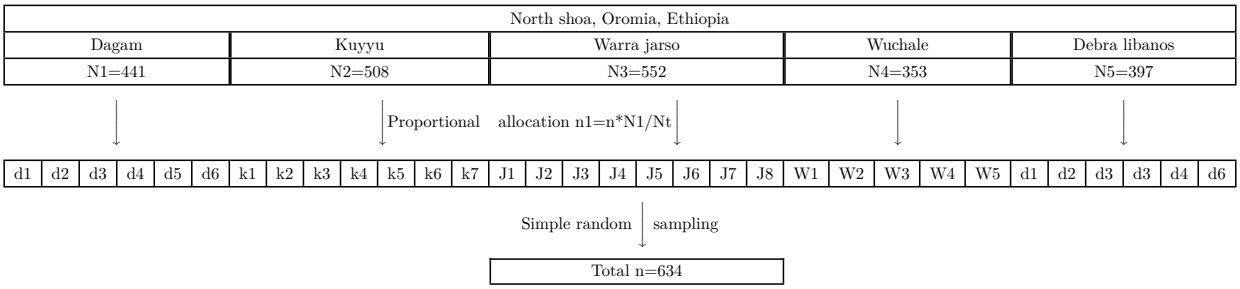
Inclusion and exclusion criteria

Babies who were born after 28 weeks of gestation and those who had more than one- thousand-gram weight up to the first 7 days after birth were included in this study.

Sample size determination

The sample size was determined using the single population proportion formula with a 5% margin of error and a 95% confidence level. A proportion of 50% was applied to maximize the sample size. To account for the design effect, the result was multiplied by 1.5, and an additional 10% was added for possible non-response. The final sample size was 634 participants.

Sampling procedure



A multi-stage sampling method was applied. First, five of the 14 districts in the North Shoa Zone were randomly selected. Within these districts, 32 kebeles (the smallest administrative units) were chosen by lottery. A census was then conducted in the selected kebeles to identify women who had given birth in the past month, yielding 2,251 eligible participants. From this group, 634 women were selected for this study by using random sampling technique.

Data collection method

An adapted data collection tool was used for data collection for different literature reviews and adjusted for this study in English [19-22] and translated to local language, Afan Oromo by an expert who has a BA in Afan Oromo language. The questionnaire was back-translated into English by an independent translator to ensure consistency. A pretest was conducted with 63 mothers (10% of the sample) in nearby Canco districts. It evaluated clarity, readability, completeness, accuracy, and the time required for interviews. Adjustments were made based on the pretest findings.

Data were collected through face-to-face interviews using a structured, pretested questionnaire in private settings to ensure confidentiality. Each interview lasted 30–40 minutes. Mothers who had lost newborns were interviewed at least ten days after the loss to allow time for recovery.

Ten trained data collectors and five supervisors, all with midwifery qualifications, conducted the fieldwork after a three-day training on study objectives, procedures, and data handling. The principal investigator and supervisors checked data daily for accuracy and completeness, and reliability was assessed using Cronbach's alpha.

Operational definitions

Early neonatal death is a death of a newborn within the first seven days of life [15].
Babies with Severe malformation refers to babies with incompatibility to survive after birth [23].
Prematurity is defined as a birth that occurs before 37 completed weeks of gestation [24].
Bad obstetric history refers to stillbirth, miscarriage, previous fatal outcomes of more abortions, Intrauterine growth restriction, and fetal death [25].

Data processing and analysis

Completed questionnaires were checked for accuracy and coded before entry into EpiData v4.2, then exported to SPSS v23 for analysis. Descriptive statistics (mean, median, frequency, percentage) were applied, and bivariate logistic regression identified candidate variables for multivariable analysis.

Variables with $p < 0.25$ were included in the multivariable logistic regression to identify independent predictors of obstetric violence. Associations were measured using adjusted odds ratios (AOR) with 95% confidence intervals, and significance was set at $p < 0.05$. Results were presented in text, tables, and figures. Model adequacy was confirmed by a non-significant Hosmer–Lemeshow test, a significant omnibus test, and checks for multicollinearity using VIF, tolerance, and standard error.

Results

Socio-demographic characteristics of mothers

A total of 631 mothers who gave birth in rural areas of North Shoa Zone participated in this study, with a response rate of 99.5%.

Table 1 Socio demographic characteristics of mothers gave birth in North Shoa, Oromia

Variables	Characteristics	Frequency	Percent (%)
Maternal age	≤18	39	6.2
	19-34	492	78
	≥35	100	15.8
Marital status	Married	580	91.9
	Single	17	2.7
	Widowed	6	0.9
	Divorced	20	3.2
	Other	8	1.3
Occupational status	Housewife	404	64.02
	Private employee	70	11.1
	Government employee	76	12
	Laborer/merchant/student	81	12.8
Religion	Orthodox	541	85.7
	Protestant	29	4.6
	Muslim	61	9.7
Ethnicity	Oromo	541	85.7
	Amhara	82	12.99
	Other	8	1.3
Educational status	Unable to read and write	231	36.6
	Primary	280	44.4
	Secondary and above	120	19.0

The mean (±SD) age of the mothers was 26.68 (±5.96) years. The majority (78%) of mothers' age group were between 19-34 years old, with the remaining moms being under the age of 18 and greater than 35years old. About 580(91.9%) of them were married and the rest were single, widowed, divorced/other. Of the total participants 541(85.7%) were Orthodox, 61(9.7%) were Muslim and 29(4.6%) were protestant. Among the respondents, 286(45.3%) and 345 (54.7%) lived in urban and rural areas respectively (Table 1).

Obstetrics Characteristics of Study Participants

Among the total of 631 mothers included in the study, 273(43.3%) were primiparous followed by 252(39.9%) were multipara, while the rest, 106(16.8%) were grand multipara. From those who were multiparous and grand multiparous women, 86(24.0%) of mothers had a birth interval of less than two years, and 272(76.0%) had greater than or equal to two years based on their last delivery.

Table 2 Obstetrics factors of mothers who gave birth in North Shoa, Oromia

Variables	Characteristics	Frequency	Percent (%)
Parity	Primi-para	273	43.2
	Multipar	358	56.7
ANC Follow up	Yes	440	69.7
	No	191	30.3
Obstetric complication	Yes	207	32.8
	No	424	67.2
Number of ANC visit	1 time	217	49.3
	2 & 3 time	162	36.8
	4 time	61	13.9
Time of ANC initiation	<16 week	136	21.5
	≥ 16 weeks	495	78.5
Immediate PNC check- up	Yes	112	17.7
	No	519	82.3
Place of delivery	Hospital	127	20.1
	Health center	167	26.5
	Health post	58	9.2
	Home	279	44.2
Delivery assisted by	TBA	164	26
	Families	115	18.2
	HEW	58	9.2
	HCP	294	46.6
Having bad obstetrical history	Yes	151	23.9
	No	480	76.1
Length of nearest health facility	<30 minute	334	52.9
	≥30 minute	297	47.1
Birth Interval (among multi and grand paras)	<2 years	86	24.0
	>2 years	272	76.0

Among the respondents, 440 (69.7%) reported at least one antenatal care visit during their most recent pregnancy. However, only 136 (21.5%) attended before 16 weeks of gestation, as recommended. In addition, 334 (52.9%) indicated that reaching the nearest health facility required more than 30 minutes of travel.

Out of 631 participants, the majority, 574(91.0%), had no chronic illness; only 57(9%) had chronic illness. Of those who had a chronic illness, most, 23(40.4%) had chronic hypertension, followed by 19(33.3%) who were HIV posetive 10(17.5%) had diabetic mellitus, and the rest 5(8.8%) had anemia. Regarding the place of delivery, more than 279 (44.2%) of women gave birth at home, followed by 167 (26.5%) who gave birth at the health center and 12(20.1%) were at hospital, while the rest, 58 (9.2%) at the health post.

According to the study participants, health care providers were the main birth attendants (294, 46.6%), followed by traditional birth attendants (164, 26%), family members or relatives (115, 18.2%), and health extension workers (58, 9.2%). Most respondents (394, 62.4%) delivered through spontaneous vaginal birth. Only

112 (17.7%) reported receiving postnatal care within the first week after delivery. Of the 631 participants, 151 (23.9%) had a history of adverse obstetric outcomes unrelated to the current pregnancy. Among these, 61 (40.4%) had experienced abortion, 49 (32.4%) had a stillbirth, and 41 (27.1%) had neonatal loss.

Newborn characteristics

Of the total 631 newborns, the majority, 364(57.7 %), were male newborns, while the rest, 267(42.3%), were female newborns. The majority, 511(81.0%), were born after 37 and below 40 weeks of gestational age, followed by 120(19.0%), who were delivered before 37 weeks of gestational age. Among all babies, 13(2.1%)had congenital anomalies, and 618(97.9%) were born without congenital anomalies. From the total 631 babies, 79(12.5%), were admitted to NICU. Among those who were admitted to NICU, 32(40.5%) were due to prematurity, followed by 21(26.6%) due to unable to feed, 19(24.1%) with neonatal infection and 7(8.8%) did not know the reason of her baby admitted to NICU.

The majority, 502(79.5%) of newborns cry immediately after delivery and the rest, 129(20.5%) did not cry immediately after delivery.

Magnitude of early neonatal death

Of the total 631 newborns, 59(9.4%) died in the early neonatal period (95%, CI: 7%-11%). From this neonatal death, the majority, 32(54.2%) neonatal deaths occurred within the first 24 hours of neonatal life in the study area as can be seen in figure 1.

Results of multivariate logistic regression analysis

In bivariate logistic regression, factors associated with early neonatal mortality were the maternal educational status of being unable to read and write, maternal age less than 18 years, no regular antenatal care follow-up, gestational age<37 weeks, having bad obstetric history, history of chronic illness, place of birth, short interpregnancy and status of the newborn immediately after birth.

Finally, after nine variables (with P-value less than 0.25 in bivariate logistic) were subjected to multivariate logistic regression, four variables were found to be significantly associated with early neonatal death. Maternal age less than 18 years, gestational age<37 weeks, immediate cry, and educational status were factors significantly associated with early neonatal death.

Factors associated with early neonatal death among babies born in North Shoa, Oromia, Ethiopia

In this finding, babies whose mothers are less than 18 years old were 1.67 times more likely to report early neonatal death (AOR 1.67(1.162-2.936)).

Table 3 Bivariate and multivariate analysis of factors associated with early neonatal death among babies born in North Shoa, Oromia

Variables	END status		COR (95% CI)	AOR (95% CI)	P value
	Dead	Alive			
Education status					
Unable to read and write	34	197	2.786(1.67-4.122) *	1.96(1.367-3.635)**	0.001
Primary	18	262	1.115(0.63-2.56)	0.654(0.251-1.706)	
Secondary & above	7	113	1	1	
Maternal age					
≤18	6	33	2.090(1.090-3.320) *	1.67(1.162-2.936)	0.00
19-34	50	442	1.301(0.790-3.320)		
≥35	8	92	1		
NICU admission					
Yes	8	71	1.106(0.542-2.793)		
No	51	501	1		
ANC					
Yes	33	407	1		
No	23	168	1.688(1.092-3.593)*		
Gestational age					
<37	23	97	3.129 (2.172-4.773)*	2.231(1.562-3.332)**	0.001
≥37	36	475	1		
Immediate PNC check-up					
Yes	9	103	1		
No	50	469	1.220(0.184-1.473)		
History of chronic disease					
Yes	8	49	1.674(1.016-2.921)*		
No	51	523	1		
Bad obstetric history					
Yes	20	131	1.726(1.283-3.277)*		
No	39	441	1		
Status of neonate immediately after birth					
Cry	37	465	1		
Not cry	22	107	2.583(1.715-4.122)*	1.686(1.0151-3.242)**	0.003
Birth attendant					
HCP	22	272	1		
HEWs	6	52	1.426(0.395-2.012)		
Other	31	248	1.545(0.695-2.25)		
Place of delivery					
Facility	25	327	1		
Home	34	245	1.815(1.1295-3.032)*		
Distance from nearest health facility					
<30 minute	27	307	1		
≥30 minute	32	265	1.373(0.295-2.455)		
Interpregnancy interval					
<2 years	46	313	2.927(1.951-4.53)*	1.786(1.251-3.644)**	0.00
>2 years	13	259	1	1	

CI=confidence interval, COR=crude odd ratio, AOR=Adjusted odd ratio. *=significantly associated in bivariate analysis, **=significantly associated in multivariate analysis

Mothers who were unable to read and write were 1.96 times more likely to have early neonatal loss as compared to those who were primary and above (AOR, 1.96(1.367-3.635)).

Babies born before the completion of 37 weeks gestation were 2.2 times more likely to die than babies born in greater or equal to 37 weeks (AOR, 2.231(1.562-3.332)). Babies who hadn't cried immediately after delivery were eight times more likely to die during the early neonatal period than those who immediately cried after delivery (1.686(AOR, 1.0151-3.242)).

Babies born having short interpregnancy intervals (less than two years' interval) were1.786 times more likely to die than long interpregnancy intervals 1.786 (1.251-3.644). See table 3.

Discussions

Magnitude of early neonatal death

In this study, early neonatal death is 9.4 % (95%, CI: 7%-11%), which indicates more than eight babies are expected to die out of 100 babies born before they celebrate their first week of birth. Our findings are notably higher than those reported in cross-sectional studies from South Africa (2.92%) and East Iran (1.68%) [26-28]. This finding may be due to the setting of the study since it targeted rural communities, where inaccessible health facilities for early neonatal treatment; it may be due to poor transport access, which leads to home birth and traditional neonatal treatment. This finding is also higher than the study conducted in six developing countries (Argentina, Egypt, India, Peru, and South Africa), where about 9 early neonatal deaths per 1000 live births [29].

The discrepancy may be explained by the setting of the study in which the previous study was conducted only on institutions as it missed home birth, which could affect the survival of the neonatal period because of disadvantages (unsafe delivery) in home birth over birth in health facilities. In addition, the figure in the previous study is an average value of the number of deaths in six countries that might minimize the magnitude of early neonatal death.

Our findings are lower than in studies conducted at Hawassa University Specialized and Referral Hospital and Wolaita Sodo Comprehensive Specialized Hospital [19, 21, 30]. This study is also lower than other studies conducted in Ethiopia [31]. The difference may be attributed to the setting of the study. In the case of this study, the study was conducted in a community where much more early neonatal death may be expected as it addresses all neonates, including neonates born at home. Therefore, it is not surprising to be higher in this. The present study is supported by the study conducted in Cameroon, where more than 12% of early neonatal deaths occur [32].

Factor associated with Early Neonatal Death

Short interpregnancy interval in the present study is significantly associated with early neonatal death. It may be explained by the fact that as the interpregnancy interval becomes shorter, the probability of overlapping breastfeeding and pregnancy also increases, which affects pregnancy outcomes, including weight and early neonatal death [33, 34]. Evidence suggests that preterm birth, low birth weight, neurodevelopmental delay, and perinatal or neonatal mortality are all more likely to occur when the birth interval is short. The finding is in line with the findings from Sweden and Afghanistan [35, 36].

In the present study, the absence of an immediate cry after birth was associated with early neonatal death. This result may be associated with distal causes that lead to the inability of a neonate to cry, which is indicative of interruption of the entrance of air to the lung of a baby and then finally able to cause early neonatal death [37]. The finding is also similar to the study conducted in Cameroon [32].

In this study, younger maternal age is associated with early neonatal death. This is because most of the mothers in this age group are primiparous, and they may give birth to babies with low birth weight, small for gestational age, which

in turn increases early neonatal death. In addition, they may lack experience in handling and caring for their babies. Furthermore, they may lack awareness about the course of pregnancy, labor, adequate advice on birth preparedness and complication readiness during prenatal care [38]. This finding is similar to the study conducted in Afghanistan [36]. However, this study contradicts a study conducted in Nigeria [39]. The disagreement may be explained by the study setting and sample size variations.

In the present study, gestation during the birth of a newborn was associated with early neonatal death, whereas babies born with gestational age less than 37 weeks were significantly associated with early neonatal death. This may be attributed to the immature development of organs in preterm infants, which limits their ability to adapt to life outside the womb. Other contributing factors could include insufficient antenatal care, limited counseling on danger signs, and inadequate long-term training in neonatal nursing, particularly since this study involved births that occurred at home [40]. This result is similar to the study conducted at Hawasa University Specialized Hospital [30].

Conclusion and Recommendations

North Shoa, Oromia, has a high rate of early newborn death, which requires additional attention when compared with data in EDHS 2016. Significantly correlated characteristics included maternal age under 18 years, gestational age under 37 weeks, short inter-pregnancy interval, and newborn status right after delivery.

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Ethics approval and consent to participate

Ethical approval and clearance were obtained from the Institutional Health Research Ethics Review Committee (IHRERC), College of Health and Medical Sciences of Haromaya University. Official letters were submitted to the North Shoa Oromia Health Bureau. Permission was also obtained from the concerned bodies. Written informed consent was obtained from their mothers/parents/legal guardians (legally authorized representatives).

Participation was voluntary, and respondents could withdraw at any stage without restriction. Confidentiality was ensured by omitting names from questionnaires, and all data were securely stored and used solely for the study. Ethical approval followed the principles of the Declaration of Helsinki.

Consent for publication

Not applicable

Availability of data and materials

All data included in this manuscript can be accessed from the corresponding author upon request through the email address.

Computing interests

The authors declare that they have no competing interests.

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Author contributions

(**AW**) conceptualized, designed the study, collected, analyzed, and interpreted the data, and drafting of the manuscript. (**TGA**), (**MBG**), (**MA**), and (**AA**) Designed the study, analyzed and interpreted the data and drafting of the manuscript, and advised the whole research paper.

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