

## RESULTS

A total of 183 participants in the intervention group and 180 participants in the control group were included in the study. The total loss to follow-up was 20.6% in the intervention and 23.5% in the control group. More than half of the current study participants were male in both groups. Regarding the age of the study participants, forty percent of the participants in both study groups were between 35 to 64 years old. At the same time, nearly half of the intervention group and almost a quarter of the control group are 65 years and above.

In terms of marital status, the result illustrated that more than half of both groups were married. Furthermore, the results showed that 16% of the intervention group and 19% of the control group were illiterate, and about 20% of them were unemployed. Seventy percent of the study participants were urban residents. In terms of income, the results indicated that 17.6% of the control group and 29.4% of the intervention group were with high income (Table 1).

**Table 1: Socio-Economic Characteristics of Study Participants in Tigray Region, 2020 (n=363)**

	Baseline		End line		Chi-square test
	Intervention (n=102)	Comparison (n=102)	Intervention (n=81)	Comparison (n=78)	
<b>Variables</b>	<b>n (%)</b>	<b>n (%)</b>	<b>n (%)</b>	<b>n (%)</b>	<b>P (&lt;0.05)</b>
<b>Sex</b>					0.39
Male	70 (68.6)	64 (62.7 )	51 (63.0)	51 (65.4)	
Female	32 (31.4)	38 (37.3)	30 (37.0)	27 (34.6)	
<b>Age group (years)</b>					0.14
18-34	15(14.7)	24 (23.5 )	11 (13.6)	15 (19.2)	
35-64	38 (37.3 )	44(43.1)	31 (38.3)	29 (37.2)	
65 and above	49 (48 )	34(33.3)	39 (48.1)	34 (43.6)	
<b>Marital status</b>					0.06
Married	63(61.8 )	53 (52.0)	50 (61.7)	46 (59)	
Single	20(19.6 )	35 (34.3)	15 (18.5)	19 (24.4)	
Divorced	11(10.8 )	7 (6.9)	10 (12.3)	7 (9)	
Widowed	8( 7.8)	7 (6.9)	6 (7.4)	6(7.7)	
<b>Education</b>					0.89
Illiterate	16( 15.7 )	19 (18.6)	13 (16)	14 (17.9)	
Primary school	28( 27.5 )	27 (26.5)	22 (27.2)	21 (26.9)	
secondary school	37( 36.3)	40 (39.2 )	32 (39.5)	31 (39.7)	
Diploma and above	21( 20.6 )	16 (15.7)	14 (17.3)	12 (15.4)	
<b>Occupation</b>					0.55
Unemployed	23 (22.5 )	30 (29.4)	18 (22.2)	23 (29.5)	
Farmer	22 (21.6 )	30 (29.4)	21 (25.9)	26 (33.3)	
Merchant	33 ( 32.4)	17 (16.7)	25 (30.9)	17 (21.8)	
Civil servant	24 ( 23.5)	25 (24.5)	17 (21.0)	12 (15.4)	
<b>Residence</b>					
Urban	72 (70.6)	61 (59.8)	58 (71.6)	42 (53.8)	
Rural	30 (29.4)	41 (40.2)	23 (28.4)	36 (46.2)	
<b>Income</b>					0.28
less than 1000	25 (24.5)	20 (19.6)	18 (22.2)	17 (21.8)	
1000-4000	47(46.1)	64 (62.7)	38(46.9)	42 (53.8)	
greater than 4000	30(29.4)	18(17.6)	25 (30.9)	19 (24.4)	

Looking at the duration of the disease, majority of the participants had above 10 years of disease duration. Very few 10% of intervention and 7.8% of the comparison groups were provided with any information on asthma either in the pharmacy or outpatient department in which the majority of them had received it more than ten years ago. Concerning smoking history, 10% of the intervention group and 14% of the control group had a history of smoking. Both study participants mainly mentioned Cold weather and dust as asthma triggers (Table 2).

**Table 2: Asthma related Characteristics of Study Participants in Tigray Region, 2020 (n=363)**

Variables	Baseline		End line		Chi-square test P (<0.05)
	Intervention (n=102) n (%)	Comparison (n=102) n (%)	Intervention (n=81) n (%)	Comparison (n=78) n (%)	
<b>Duration of disease (years)</b>					<b>0.27</b>
1-10 years	37 (36.3)	43 (42.2)	32 (39.5)	32 (41)	
above 10 years	65 (63.7)	59 (57.8)	49 (60.5)	46 (59)	
<b>Received asthma education</b>					<b>0.12</b>
Yes	11 (10.8)	8 (7.8)	8 (9.9)	7 (9)	
No	91 (89.2)	94 (92.2)	73 (90.1)	71 (91)	
<b>Time of asthma education</b>					<b>0.13</b>
below 10 years	5(4.9)	2(2)	4 (4.9)	3 (3.8)	
above 10 years	6(5.9)	6 (5.9)	6 (7.4)	1 (1.3)	
NA	91(89.2)	94 (92)	71 (87.7)	74 (94.9)	
<b>History of smoking</b>					<b>0.41</b>
No	92 (90.2)	88 (86.3)	71 (87.7)	69 (88.5)	
Yes	10 (9.8)	14 (13.7)	10 (12.3)	9 (11.5)	
<b>Asthma triggers as reported by the study participants</b>					<b>0.69</b>
Cold weather	26( 25.5 )	28 (27.5)	20 (24.7)	21 (26.9)	
Dust	23(25.5)	29 (28.4)	19 (23.5)	26 (33.3)	
Strong smell ( spray, perfume)	14( 13.7 )	13 (12.7)	12 (14.8)	9 (11.5)	
Smoke	20(19.6 )	20 (19.6)	17 (21)	13 (16.7)	



## The effect of the Education intervention

### Asthma control level

Asthma control level improved highly in the intervention group but the improvement in the control group was insignificant. The intervention group, a lesser proportion of respondents (27.5%) had well controlled level of asthma at baseline and a higher proportion (46.9%) had well controlled level of asthma post intervention, thus a difference of 19.4% was gained. Regarding the comparison group, a lesser proportion of respondents (22.5%) had well controlled asthma level at baseline and a slightly greater proportion (23.1%) had well controlled asthma control level post intervention, thus a difference of 0.6% was documented. Overall, the intervention group showed 18.8% (DiD) increase compared to the comparison group (Table 3). In the intervention group poorly controlled level of asthma reduced from 56.9% to 38.3% and partially controlled level of asthma was reduced from 15.7% to 14.8%. In the control group poorly controlled level increased from 22.5% to 24.4% while from 54.9 to 52.6 reduction was observed on partially controlled level of asthma.

**Table 3 Change between baseline and end line of Asthma Control level between the comparison group in Tigray Region, 2020 (n=363)**

Asthma control levels	Time	Intervention n(%)	Control n (%)	Difference %
Well controlled	<b>Baseline</b>	28(27.5)	23(22.5)	5
	<b>End-line</b>	38(46.9)	18(23.10)	23.8
	<b>Difference %</b>	19.4	0.6	<b>18.8 (DiD)</b>

After controlling for potential confounders the DiD analysis showed a significant difference in asthma control level between the comparison groups. The linear regression unstandardized coefficient showed that the level of asthma control among participants in the intervention group is 6.3 times higher than among the control groups (P=0.03) after adjusting for sex, age, education, income, and duration of disease (Table 4).

**Table 4 Estimating effect of the intervention on asthma control level between study groups after adjusting for other variables in Tigray Region, 2020 (n=363)**

Variables	Unstandardized coefficients	T	95% CI for B		P value
			Lower	Upper	
Time and Program Interaction	6.305	2.160	.611	12.000	0.030*
Sex	1.557	1.007	-1.485	4.598	.448
Age	-.974	-.951	-2.988	1.039	.568
Education	.353	.463	-1.145	1.850	.466
Income	-.002	-.002	-2.061	2.058	.999
Duration of disease in years	-1.073	-.728	-3.970	1.825	.467

\* Statistically significant

#### Asthma self-management knowledge level

Asthma self-management level improved highly in the intervention group but the improvement in the control group was insignificant. In the intervention group, a lesser proportion of respondents (2.9%) had good knowledge level at baseline and a higher proportion (27.2%) had good knowledge level post intervention, thus a difference of 24.3% was obtained. Regarding the comparison group, a lesser proportion of respondents (2%) had good knowledge at baseline and a slightly greater proportion (2.7%) had good knowledge post intervention, thus a difference of 0.7% was documented. Overall, the intervention group showed 23.5% (DiD) increase compared to the comparison group (table 5).

**Table 5 Change between baseline and end line of Asthma self-management Knowledge level between the comparison group in Tigray Region, 2020 (n=363)**

Knowledge levels	Time	Baseline n (%)	End line n(%)	Difference %
Good (> 75%)	Baseline	3(2.9)	2(2)	0.9
	End-line	22 (27.2)	3 (2.7)	24.5
	Difference %	24.3	0.7	<b>23.6 (DiD)</b>

After controlling for potential confounders the DiD analysis showed a significant difference in asthma self-management knowledge level between the comparison groups. The linear regression unstandardized coefficient result showed that the level of having good knowledge on asthma self-management among participants in the intervention group is 13.3 times higher than among the control groups ( $P < 0.001$ ) after adjusting for sex, age, education, income, and duration of disease (Table 6). In the intervention group, poor knowledge reduced from 86% to 42% but adequate knowledge increased from 10.8% to 30.9%. Looking at the control group poor level of knowledge reduced from 81% to 80.8% and adequate knowledge level from 16.7% to 16.7%.

**Table 6 Estimating the effect of the intervention on asthma self-management knowledge level between study groups after adjusting other variables in Tigray Region, 2020(n=363)**

Variables	Unstandardized coefficients	T	95% CI for B		P value
			Lower	Upper	
Time and Program Interaction	13.338	3.996	6.717	19.959	.000**
Sex	-3.500	-1.946	-7.036	.037	.052
Age	1.664	1.398	-.677	4.006	.163
Education	-.074	-.084	-1.815	1.667	.933
Income	.370	.304	-2.025	2.764	.762
Duration of disease in years	-2.325	-1.357	-5.694	1.044	.176

\*\* Highly statistically significant

## Outcome Measures

### Asthma control level

Asthma control was assessed using a validated tool the Asthma control test. It consists of 5 items assessing the presence or absence of nocturnal symptoms, daytime symptoms (coughing, chest tightness and wheezing), rescue medications, symptom interference with daily activities and absenteeism from work or school. Responses for the five items are summed to yield a score ranging from 5 (poorly controlled) to 25 (complete control). Thus, the score is summed as 20–25 = well-controlled asthma, 16–19 = partially controlled, and 5–15 considered as uncontrolled asthma. With higher scores indicating better control. A score of 19 or less has been defined as a cut-off score

suggesting poor control. Then these three levels get changed to percentiles for linear regression analysis (27-29)

### **Self-management knowledge level**

Self-management knowledge level was assessed using a validated Asthma Self-Management Questionnaire (ASMQ). Although the standard ASMQ comprised 16 questions that assessed protective awareness, inhaler use, medication use (rescue and control), and peak flow meter use (Mancuso, Sayles et al. 2009), two questions about peak flow meter were removed from our study because they are not applicable in Ethiopia. The tool's scores were determined as follows: each preferred response was given one point; the points were then added up to create a raw score range of 0–14; the raw score was then converted to a range of 0–100, with higher scores indicating a higher level of knowledge. Knowledge level was classified into the following: i. Good knowledge (ASMQ > 75 transformed), ii. Adequate knowledge (transformed ASMQ = 50–75) and iii. Poor knowledge (transformed ASMQ < 50) (19) Items were phrased as questions with four response options with variable choices. Then they were recode again to get the final result as 0 and 1 to get the transformed result out of the total 14 responses. We calculated mean scores across all items with higher scores reflecting more knowledge levels.

### **Asthma self-management Education**

The education program was held at three sessions for each selected intervention group for 1 to 2 hours in the OPDs. During the educational program, each group included 13 to 16 patients. The education included basic facts about asthma, appropriate use of inhaled medications, environmental control strategies, self-monitoring skills and a written asthma management action plan. Teaching methods were lectures, group discussions and demonstrations. Leaflet was provided for each intervention study participant, which was prepared with simple words in a local language (Tigrigna) to use as a reminder. The ASME intervention started with the preparation of manuals for the education facilitators and the study participant, followed by training the education facilitators. Finally, the potential asthma education facilitators provided education intervention for the intervention group in each selected hospital. The study group for the intervention group met during the data collection, at three months and at six months, during which each discussion session lasted for an hour or two. The post-test evaluation for control and intervention groups was conducted after ten months instead of 6 months because of COVID-19 movement restrictions. Of

the 204 subjects who were recruited as study participant, 45 patients had an irregular follow-up. They were excluded from the study at the time of analysis. Out of the 45 dropped-out patients, eight did not come on the 3<sup>rd</sup> month, 13 on the sixth month, and 24 dropped out at the post test evaluation time.