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Knowledge, Attitude, and Practice Regarding Charcoal Consumption among Households in Sanaag Province, North-Eastern Somalia

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Abstract: Charcoal consumption is prevalent in the Sanaag province of North-Eastern Somalia amidst the energy crisis, leading to destruction of the fragile environment and negative impacts on citizen's health. This study seeks to evaluate charcoal consumption trends among households. The objectives were to assess the households' level of knowledge, attitude, and practice (KAP) regarding charcoal consumption, and to determine the association of knowledge and attitude with practices. A questionnaire was designed and distributed to 343 households who were selected using a multistage random sampling technique. Data were analyzed by both descriptive and inferential statistics using SPSS. Findings showed that 79.3% of the respondents have a good level of knowledge, 63.6% have fair level of attitude, and a fair level of practice was displayed by 77.3%. A significant association was found of charcoal consumption practices with knowledge, but not with attitude. Results also suggest that good knowledge does not necessarily translate into good practice. Improving knowledge and attitude through appropriate intervention programs or policies can ensure sustainable charcoal consumption practice. This study is a substantial contribution to the literature on KAP relating to charcoal consumption among households in Somalia.

Keywords: charcoal consumption; households; knowledge; attitude; practice; Somalia

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1. Introduction

One of the major energy consumers, especially for domestic cooking and heating, is the household sector. Common energy sources include electricity, liquefied petroleum gas, kerosene, fuelwood, and charcoal. Energy demands have increased significantly recently due to population and urbanization growth, and this has led to higher fuelwood and charcoal consumption [1]. Reports state that about 3 billion people globally rely on fuelwood or charcoal for their daily cooking activities, and these are mostly residents of the developing nations [2,3]. Charcoal is the dark grey residue consisting of carbon produced through a slow process of heating wood in the absence of oxygen otherwise known as pyrolysis [4]. It has been noted that it is more attractive than fuelwood owing to higher heating values and cheaper transport costs in terms of energy density. Global charcoal production is expected to steadily increase in the coming decades due to population growth, poverty, urbanization, and the relatively high prices of alternate energy sources for cooking [5].

In Somalia, charcoal, referred to as dhuxul in Somali, has been and will remain the principal cooking energy used by millions of households for centuries, unless alternative energy is introduced [6]. Charcoal is produced in Somalia primarily from slow-growing species of Acacia trees with a similar practice found in other East African countries, such as Ethiopia, Kenya, and Tanzania. In a study to rapidly map and estimate the impact of illegal

charcoal production in southern Somalia using 2011 and 2013 satellite imagery, Bolognesi et al. [7] reported an average production of 24,000 tons of charcoal and 2.7% tree loss within the two-year interval. A recent report corroborated this by noting that between 100,000 and 250,000 tons of charcoal are produced in Somalia where up to 4.4 million mature trees are felled, resulting in land clearance of about 73,000 ha [8].

Nevertheless, the charcoal business known as black gold in Somalia, with a huge monthly export into neighboring countries [9], has continued to thrive. For instance, it was estimated that the charcoal business from the Kismayo port of Somalia was in the tune of 25 million US dollars every year [10]. Dependency on charcoal is not only destroying the environment but also negatively impacting the health of women, who are its main users [6]. They are exposed to black dust, smoke and soot inhalation, which affects their respiratory system and eyesight. The women living in the study area are mostly unaware of the health effects of this traditional fuel dependency.

It has been reported that increasing demand for charcoal and its unsustainable value chain are expected to cause increased Greenhouse gas (GHG) emissions, with consequent impacts on climate change [5]. The woodlands are most likely to be affected, thereby putting the future wood-energy supply at stake. Without realistic, renewable alternatives to charcoal in many countries in the coming years, it is essential to green the charcoal value chain. When produced from sustainable resources and improved technologies, the use of charcoal has the potential to reduce GHG emissions and help mitigate climate change, while simultaneously contributing to energy access and income generation, especially among the very poor.

Goal 12 of the Sustainable Development Goals (responsible consumption and production) is to ensure sustainable consumption and production patterns. One of the key targets is to achieve the sustainable management and efficient use of natural resources by 2030 [11]. This requires an urgent reduction of our ecological footprint by changing the way goods and resources are produced and consumed. Charcoal consumption can be sustainable when the constituents of sustainable consumption as summarized by Ahamad and Ariffin. [12] are considered. These include improving quality of life, assuring environmental protection, resource efficiency, and meeting the needs of future generations.

In Somalia, just as in many developing countries, women and young girls are mainly the ones who engage in cooking activity in their various households. This is not without its attendant health challenges as opined by [6]. As a result, their knowledge about charcoal use and its associated health problems, the availability and ability of utilizing alternative fuels in the market cannot be taken for granted. In an attempt to encourage sustainable consumption of charcoal, establishing the responsiveness of the common people on the health effects and environmental impact of the usage of charcoal is a vital factor. This is where a knowledge, attitude and practice (KAP) survey becomes necessary. According to Vandamme [13], the KAP survey investigates human behavior related to a certain topic, and simultaneously identifies what people know (knowledge), how they feel (attitude), and what they do (practice). Such a survey proposes that knowledge forms attitude, and both knowledge and attitude are the building blocks for practice [14].

Given that there is a dearth of KAP studies on charcoal consumption in Somalia, this study sought to evaluate the charcoal consumption trends among households in the Sanaag Province of North-Eastern Somalia. Specifically, the objectives were to assess the households' level of knowledge, attitude, and charcoal consumption practices, and to determine the association between knowledge and attitude with practice. It is hypothesized that charcoal consumption as practiced by householders in North-Eastern Somalia is affected by their knowledge and attitude. The study is envisaged to inform relevant stakeholders on the potential intervention required for the sustainable charcoal consumption to reduce the associated effects.

2. Materials and Methods

2.1. Study Area

Badhan town is located in the Sanaag Province in North-Eastern Somalia and the study was conducted in five wards in Badhan (Figure 1). The region has a total population of 544,123 according to the population estimation survey in 2014 [15]. Climatically, this area is semi-arid of rainfall ranging between 100 and 200 mm per year. The annual temperature is between 24 °C and 28 °C, and may vary from time to time in accordance with the four transition seasons in Somalia. The study data were collected in the summer when the weather was very windy and hot. During the study, it was observed that gigantic soils were eroded and advanced gully erosion occurred in the area and its surroundings. This location was chosen because there was a baseline study carried out in this area on the effect of tree density layers in the community. The study revealed that after five years of observation from 2001 to 2006, the deforestation increased to an average of 2.8% annual tree loss with the total absence of regrowth during the five-year study period. The study confirmed that there was a tremendous ecological impact of tree cutting for charcoal on tiger bush vegetation [16].

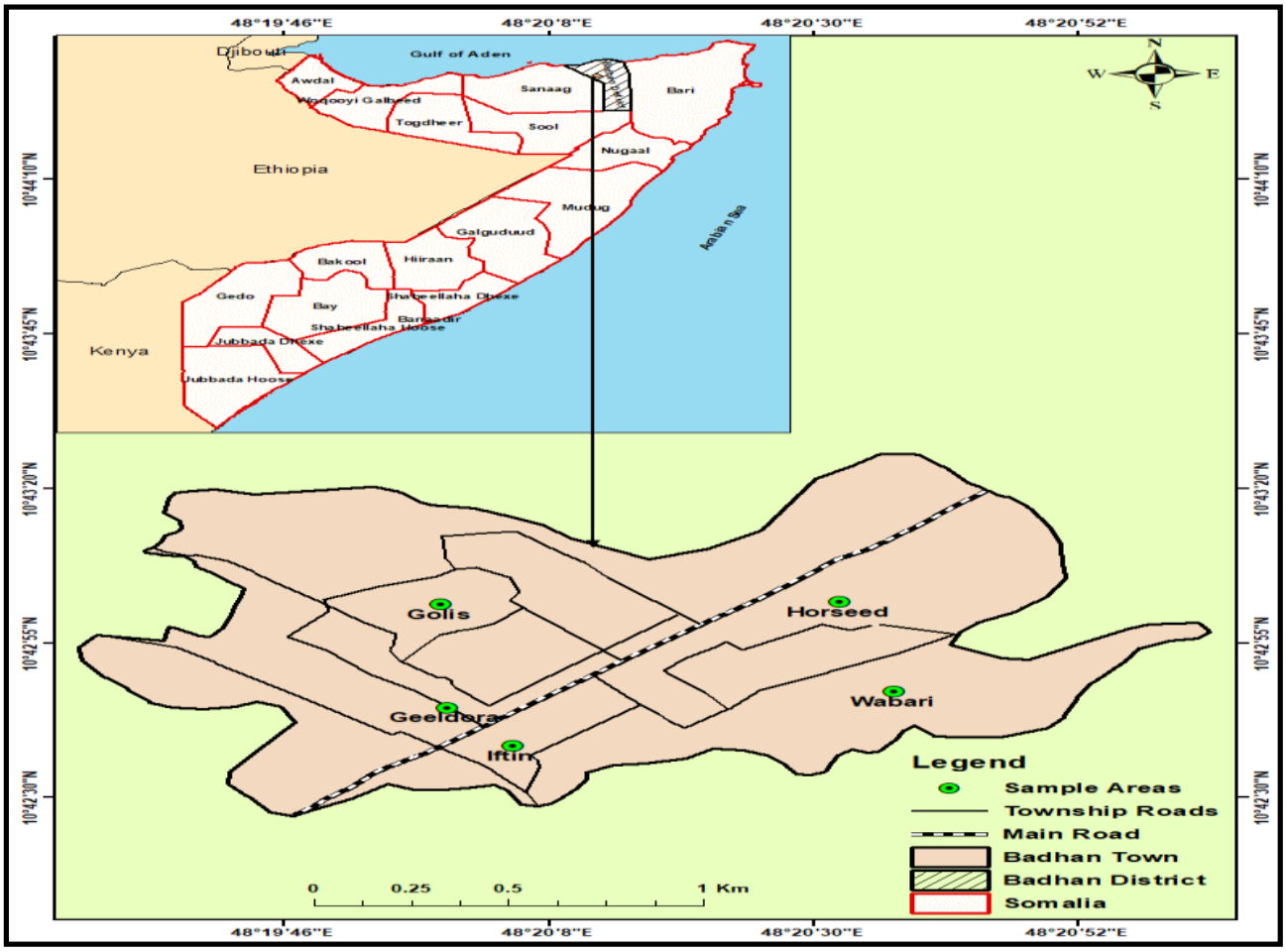


Figure 1. Map of the study area and sampling locations.

2.2. Sampling Procedures

In order to define a proper sampling scheme, the study employed a multistage sampling technique. It was performed on all the five districts under the province. Purposive sampling was used in choosing one district among them. This technique is essential to find the people who have similar background knowledge and experience, and also to incorporate the population density and the geographic location as described by [17]. The

total population strength of 4000 households living in various wards in Badhan was verified from an organization that operates in the study area named African Development Solution (ADESO). The sample size of 351 was estimated based on Krejcie and Morgan's table [18]. During the data collection process, a systematic sampling was performed with a five-interval scale in each of the five wards of Badhan town.

2.3. Data Collection Techniques

The instrument in this study was a structured questionnaire for a face-to-face interview. The content of the questionnaire was validated by experts with experience in or relevant to sustainable consumption. There were 20 respondents interviewed in the pre-test to assess the clarity of the items in the survey questions before finalizing the questionnaire. Subsequently, 34 respondents were interviewed in the pilot study, which was 10% of the sample size, to check the reliability of the results. The pilot study results were analyzed by using Cronbach's alpha coefficient, in which the scores of knowledge statements were 0.642, the attitude scale was 0.823, and the practice statements were 0.596. Therefore, the content of the statement and the wordings were modified for better understanding, and to encourage the participation of the respondents. Since the study was conducted in Somalia, the questionnaire was translated into the local language. The actual survey interviewed 343 households in five wards in the Badhan district of North-Eastern Somalia. This area is where the majority of the charcoal consumption is linked with a wide range of environmental problems, mainly deforestation. The data were collected in the morning and the afternoon after the workload had slowed down. The respondents were informed about the purpose of the study and proper instructions were given before the interview and it was strictly a voluntary contribution from the populace. Each respondent was given 15–20 min to complete the interview and if they had difficulty to read and answer, the researcher facilitated them with necessary assistance.

2.4. Questionnaire Design

The questionnaire was designed in four parts, which contained a total of 42 questions. The parts include demographic profile (12 questions), knowledge on charcoal consumption (10 statements), attitude towards charcoal consumption (12 statements), and charcoal consumption practices (8 questions). The level of knowledge, attitude and practice were determined by assigning individual scores to items in each respective section. At the same time, scores were reversed for statements that were negatively composed. The items in the knowledge on charcoal consumption section were designed as true/false statements. The correct answer for each question was awarded 1 point, whereas wrong answers were marked as 0. The scores in this section of the questionnaire ranged from 0 to 10. For the section on attitudes towards charcoal consumption, statements were designed using a five-point rated Likert scale (5 = strongly agree, 4 = agree, 3 = not sure, 2 = disagree, and 1 = strongly disagree). Being a 12-statement section, the scores ranged from 0 to a maximum of 60. In the charcoal consumption practice section, the questions were on a yes or no basis. The correct answer for each question was awarded 1 point, whereas wrong answers were marked as 0. Items were then given individual scores from 0 to 1 implying that for 8 questions, the minimum score is 0 and a maximum score is 8. In each section, the total individual scores were classified into three levels as mostly employed in such studies [12,19] and were based on defined percentages as follows: Poor ($\leq$50%), Fair (51% to 80%), and Good ($\geq$80–100%).

2.5. Data Analysis and Interpretation

Statistical Package for Social Sciences (SPSS), version 20, was used to analyze the data generated from the questionnaire. Frequencies, percentages, and means were calculated for socio-demographic characteristics, levels of charcoal consumption knowledge, attitude, and practice. The association between knowledge, attitude and practice was tested using Pearson's Chi-square test for independence. Simple linear regression was used to measure

the relationship between household practice as the dependent variable and their knowledge and attitude towards charcoal consumption as the independent variables. Statistical significance was tested at 95% significance level ($p \leq 0.05$).

2.6. Ethical Statement

Prior to the beginning of the survey activities, ethical clearance was sought for and granted by the local authorities in Sanaag Province. The respondents individually gave their consent before the interviews and discussion took place. Additionally, the objectives, procedures, benefits and discomforts of the study were explained and they were assured of confidentiality. Their voluntary participation was recorded through a thumb print or signature before the interviews were conducted.

3. Results

3.1. Demographic Profile

Table 1 presents the socio-demographic characteristics of the 343 participating households in this study. There were 71.0% females with the average age being 34 years, 37% of the respondents were youths (15–24 years), and 63% were adults (above 24 years) in reference to the United Nation's standards of age group definition [20]. A majority of the respondents (65.3%) had low level of education. However, 35% had attained higher education levels. Those who fall under low education include respondents with no formal education and formal education up to secondary level. Higher education levels represent those with tertiary education. There were 70% of the households who were married and a majority of the respondents (49.0%) were housewives, followed by a small number of business owners (29.4%). Additionally, 64.7% of the respondents earn a low income that is equivalent to ≤200 USD as their monthly gross household income.

Table 1. Households' demographic characteristics.

Variables		Frequency	Percentage
Gender	Male	101	29%
	Female	242	71%
Age (years)	Youths	135	62.7%.
	Adults	80	37.3%
Marital Status	Married	265	77.3%
	Single	46	13.4%
	Divorced	12	3.5%
	Widow	20	5.8%
Education	Low Education	224	65.3%
	Higher Education	119	34.7%
Occupation	Housewife	168	49.0%
	Small Trade Business	101	29.4%
	Student	21	6.1%
	Skilled Worker	15	4.4%
	Livestock Business	8	2.3%
	Farmer	1	0.3%
	Unemployed	19	8.5%
Income	Low income	222	64.7%
	High income	121	35.3%

3.2. Cooking Characteristics

Charcoal, fuelwood, kerosene, liquefied petroleum gas (LPG) and electricity are sources of cooking fuels used in Somalia. However, respondents in the study area chose differently as to what constituted their primary cooking fuel. Figure 2 shows that the majority of the households surveyed were using charcoal as the primary cooking fuel (43.4%), followed by firewood (21.9%), liquefied petroleum gas (LPG) (21.3%), and kerosene (13.4%). Although electricity is available, it is hardly used for cooking in the study area.

The results show that charcoal and firewood were the most used cooking fuel as compared to the other alternative cooking fuels. The public could only imagine the quantity of wood harvested and burned to meet the cooking fuel demand in the households and the potential outcomes of deforestation and climate change, including other adverse impacts on health, and valuable time and efforts devoted.

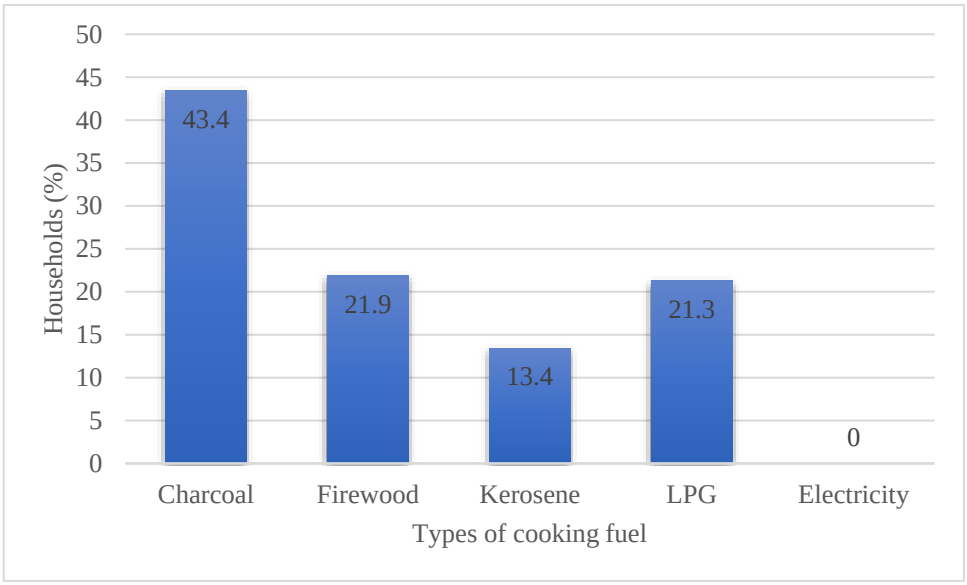


Figure 2. Primary cooking fuel used.

Figure 3 shows that a majority of the households surveyed (57.1%) were using traditional cook stoves, which usually burn with the solid fuel immensely. Most of the respondents who were using LPG or kerosene, simultaneously depend on the traditional cook stove for specific food items. A study reported that the traditional biomass cook stove is inefficient at converting the whole energy into heat, leading to a large consumption of fuelwood and harmful gases emission [21].

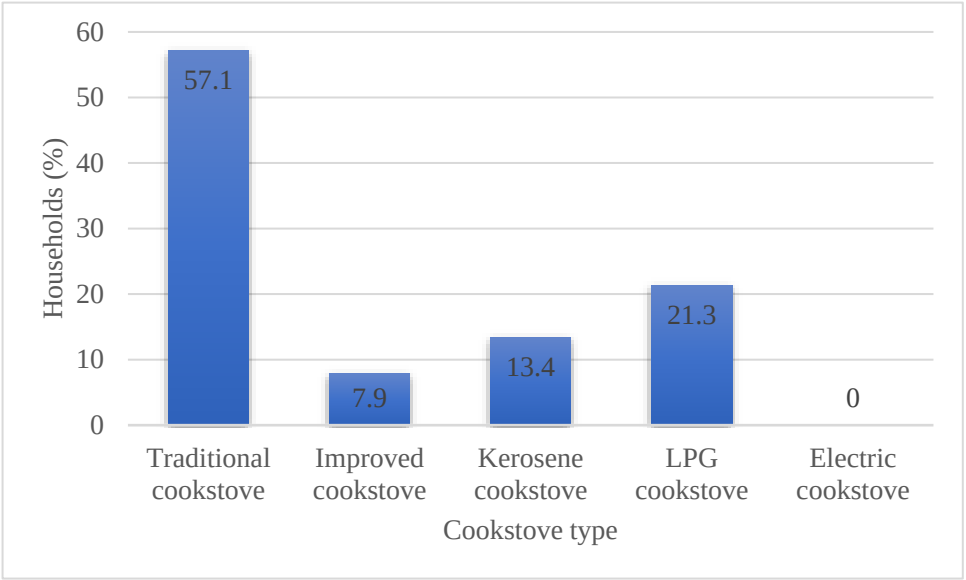


Figure 3. Types of cook stoves used for cooking.

As per Figure 4, the majority of the surveyed households (60.9%) considered economic affordability and the readily available source as the factor for choosing the cooking fuel.

Only 2% of the respondents were concerned about the safety and health issues while choosing the cooking fuel. It can be observed that the households were compelled to use the smoke-emitting cooking fuel regardless of the hazards involved in it.

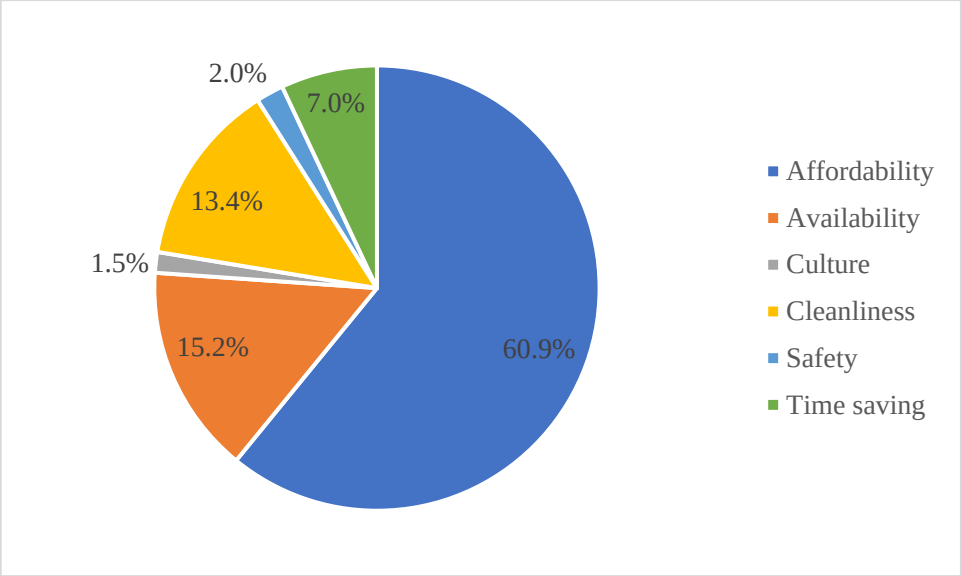


Figure 4. Factors responsible for choosing the cooking fuel.

3.3. Knowledge of Charcoal Consumption among Households

The questions posed in this section were meant to identify what the households know about charcoal consumption. Table 2 shows the frequency and percentage of charcoal consumption knowledge. From the result, it can be observed that only two of the items received correct answers with less than 90% (n = 243 and n = 286). Item 1 in particular received 100% correct answers (n = 343), clearly showing that they are aware charcoal is made from wood. Regarding the requirement for charcoal production and its effect on the environment, both items received over 99% correct answers. The households' knowledge about the improved charcoal cook stoves on the reduction of charcoal consumption was adequate, 94.8% (n = 325) gave affirmative answers. Nevertheless, in view of using the improved cook stoves, most complained about the price, which is costly as compared to the traditional cook stoves. Additionally, 83.4% of the respondents agreed that the charcoal use affects mostly females and children who mainly engage in the household cooking activities and are usually at home for the whole day. This supports the position of Kpalo et al. [22] that women and children are the most exposed to adverse effects of indoor air pollution.

Table 3 shows the level of the households' knowledge on charcoal consumption. The majority (n = 272, 79.3%) of the households are classified as those with good knowledge. From the assigned minimum score of 0 and maximum score of 10, the lowest score recorded was 5 (n = 3, 0.9%) and the highest was 10 (n = 197, 57.4%). The total mean score and standard deviation recorded was 9.22 $\pm$ 1.121 as shown in Table 3. Given that the level of education for majority respondents is low, it is obvious that the households are knowledgeable about charcoal consumption based on the questions asked and their responses.

Table 2. Distribution of charcoal consumption knowledge (n = 343).

S/No	Statements	True	False
		***n* (%)**	***n* (%)**
1	Charcoal is a bi-product of wood.	343 (100%)	0 (0%)
2	Excessive use of charcoal requires a huge quantity of wood.	341 (99.4%)	2 (0.6%)
3	Indiscriminate cutting of trees for charcoal production leads to deforestation.	342 (99.7%)	1 (0.3%)
4	Burning fuelwood will increase carbon emissions in the atmosphere.	321 (93.6%)	22 (6.4%)
5	Cooking with charcoal consumes time as compared to the modern alternative fuel.	324 (94.5)	19 (5.5)
6	Cooking with charcoal has health implications such as respiratory diseases.	243 (70.8%)	100 (29.2%)
7	Improved charcoal cook stoves can reduce the amount of charcoal consumption.	325 (94.8%)	18 (5.2%)
8	Improved charcoal cook stoves can reduce the health implications.	316 (92.1%)	27 (7.9%)
9	Female and children in the households experience the greatest effects of charcoal barriers.	286 (83.4%)	57 (16.6%)
10	Cutting the trees will impact ecosystem-regulating services like erosion control and water purification.	323 (94.2%)	20 (5.8%)

Table 3. Level of knowledge on charcoal consumption (n = 343).

Level	Frequency	Percentage	Mean ± Std
Poor	3	0.9	9.22 ± 1.121
Fair	68	19.8	
Good	272	79.3	

3.4. Attitude towards Charcoal Consumption by Households

The items in this section were used to determine how the households feel about charcoal consumption. The frequency and percentage of attitude towards charcoal consumption knowledge is shown in Table 4. There were 93.3% of the respondents who agreed that the charcoal production substantially contributes to deforestation as compared to the agriculture and overgrazing activities. Similarly, 91.3% believed that the consumption of charcoal is a threat to the environment. The position of the respondents reaffirms that charcoal production is a big threat to biodiversity because it targets specific preferred species found in natural forests and woodlands [23]. The consideration for clean energy revealed that 90.1% opted for modern cooking fuel as a better option than traditional cooking fuel. However, 56% find it fun and enjoyable to cook with charcoal because whole family members can come together while cooking lasted. Additionally, the majority of the surveyed households (85.4%) agreed that the use of charcoal cook stoves in a ventilated location can reduce the indoor air pollution and thereby reduce exposure. To ensure resource efficiency, 92.4% of the households have interest in attend any meeting meant to promote cooking energy efficiency.

Table 4. Distribution of households based on attitude (n = 343).

S/No	Statements	SA	A	NS	SD	D
		n **(%)**	***n*** **(%)**	***n*** **(%)**	***n*** **(%)**	***n*** **(%)**
1	I believe the high demand of charcoal for both local and international markets have led to uncontrolled commercialisation.	72 (21.0%)	229 (66.8%)	17 (5.0%)	13 (3.8%)	12 (3.5%)
2	Charcoal production contributes immensely to deforestation as compared to agriculture and overgrazing activities.	91 (26.5%)	229 (66.8%)	12 (3.5%)	6 (1.7%)	5 (1.5%)
3	I believe cutting a huge quantity of wood for charcoal contributes to floods and droughts.	127 (37.0%)	198 (57.7%)	8 (2.3%)	5 (1.5%)	5 (1.5%)
4	Peoples' low quality of life adds more pressure on charcoal production.	68 (19.8%)	190 (55.4%)	52 (15.2%)	18 (5.2%)	15 (4.4%)
5	I consider charcoal consumption as a threat to the environment.	97 (28.3%)	216 (63.0%)	14 (4.1%)	6 (1.7%)	10 (2.9%)
6	By cutting trees for charcoal production, many environmental services are missing	78 (22.7%)	240 (70.0%)	13 (3.8%)	8 (2.3%)	4 (1.2%)
7	I consider modern cooking fuel as a better option than traditional cooking fuel.	68 (19.8%)	241 (70.3%)	5 (1.5%)	23 (6.7%)	6 (1.7%)
8	Cooking with charcoal is fun and enjoyable.	23 (6.7%)	169 (49.3%)	50 (14.6%)	35 (10.2%)	66 (19.2%)
9	Using charcoal cook stoves in a ventilated location can reduce the exposure of indoor air pollution.	33 (9.6%)	260 (75.8%)	25 (7.3%)	13 (3.8%)	12 (3.5%)
10	Good environmental behaviour regarding energy consumption will save the resources.	58 (16.9%)	260 (75.8%)	8 (2.3%)	11 (3.2%)	6 (1.7%)
11	Our household is interested in attending educational meetings on promoting cooking energy.	71 (20.7%)	246 (71.7%)	10 (2.9%)	7 (2.0%)	9 (2.6%)
12	Safe cooking energy is a part of economic, social, and environmental sustainability.	56 (16.3%)	258 (75.2%)	18 (5.2%)	7 (2.0%)	4 (1.2%)

The level of the households' attitude towards charcoal consumption is shown in Table 5. About 63.6% (n = 218) of the households fall into the fair attitude category, and this forms the majority. Only 1.5% (n = 5) are adjudged to have poor attitude while 35% (n = 120) have good attitude. The assigned minimum score was 0 and maximum score was 60 in this section. The lowest score recorded was 12 (n = 3, 0.9%) and the highest was 60 (n = 2, 0.6%). The total mean score and standard deviation recorded was 47.55 ± 5.55 as shown in Table 5. This results in this study have demonstrated that respondent's attitude towards charcoal consumption must have been informed by the knowledge they have. Similarly, Ahamad and Ariffin, [12] reported that high levels of knowledge certainly were accompanied by more students with moderate and high attitudes, validating knowledge being essential to foster attitude as both are interconnected. However, the study concluded that having a high knowledge does not necessarily result in high attitudes.

Table 5. Level of attitude towards charcoal consumption (n = 343).

Level	Frequency	Percentage	Mean ± Std
Poor	5	1.5	47.55 ± 5.55
Fair	218	63.6	
Good	120	35.0	

3.5. Charcoal Consumption Practice of Households

The questions posed in this section were meant to identify what the households do in terms of charcoal consumption. Table 6 shows the frequency and percentage of charcoal consumption practice. Of the 8 items, 5 received over 90% of the correct answers, 1 received over 80%, while the remaining 2 received less than 50%. The result also shows that charcoal is consumed by all the respondents; however, utilization as the sole fuel for cooking is practiced by only 28.9% of the respondents. Additionally, a larger percentage (47.2%) cook with both charcoal cook stoves and modern cook stoves. During cooking, 93.3% of the respondents place their charcoal cook stove where there is ventilation. This is significant as it helps to prevent indoor air pollution. To conserve resources and show commitment to responsible consumption, the majority (95.6%) say that they switch off the cook stove by quenching the fire after cooking which enables them to reuse the remaining charcoal. Furthermore, 83.7% of the households say they are involved in programs related to the reduction of charcoal consumption. The majority of the households are aware of the effects of unsustainable production of charcoal and this may have informed such a practice.

Table 6. Distribution of households based on practice (n = 343).

S/No	Statements	Yes	No
		n (%)	*n* (%)
1	I use charcoal solely for cooking.	99 (28.9%)	244 (71.1%)
2	I combine the charcoal cook stove with the modern cook stove in cooking.	162 (47.2%)	181 (52.8%)
3	I put the charcoal cook stove in a ventilated location while cooking.	320 (93.3%)	23 (6.7%)
4	I always switch off the cook stove after use for future charcoal reuse.	328 (95.6%)	15 (4.4%)
5	I use cooking fuel types based on the kind of meals being prepared.	309 (90.1%)	34 (9.9%)
6	We are planning to come up with energy efficiency methods for cooking.	316 (92.1%)	27 (7.9%)
7	I consider safety before and after cooking with charcoal	324 (94.5%)	19 (5.5%)
8	As a household, we are involved in programs related to the reduction of charcoal consumption.	287 (83.7%)	56 (16.3%)

The level of charcoal consumption practice among the households is shown in Table 7. About 77.3% (n = 265) of the households have a fair practice similar to their attitude, which also forms the majority. The result also shows the distribution of those whose practice is poor (n = 63, 18.4%). The assigned minimum score was 0 and maximum score was 8 in this section. The lowest score recorded was 0 (n = 1, 0.3%) and the highest was 8 (n = 15,

4.4%). The total mean score and standard deviation recorded was 6.25 ± 1.085 as shown in Table 5. Evidently, this study demonstrates that a good environmental knowledge and attitude does not always translate to a commensurate good practice. The level of charcoal consumption practice among the households is not the same as the level of charcoal consumption knowledge they exhibited.

Table 7. Level of practice of charcoal consumption (n = 343).

Level	Frequency	Percentage	Mean ± Std
Poor	63	18.4	6.25 ± 1.085
Fair	265	77.3	
Good	15	4.4	

3.6. Association between Independent and Dependent Variables

The result of the Pearson's Chi-square test for independence performed to determine the association between knowledge, attitude, and practice is shown in Table 8. The indication from the result is that households with good knowledge and fair attitude are inclined to practice fairly. Statistically, a significant relationship is seen between knowledge and practice but the relationship between attitude and practice is not significant ($p \leq 0.05$). The lack of association between attitude and practice in this study is not surprising and is backed by numerous studies that found low or no association between attitudes and practices as reported in Wang et al. [19]. However, there is a need to further investigate why attitudes do not translate into practices; this could be a subject of future research.

Table 8. Association between knowledge, attitude, and charcoal practice levels.

			Practice			
		Count	**Poor**	**Fair**	**Good**	***p*-Value**
Knowledge	Poor	3	3 (100%)	-	-	0.000 *
	Fair	68	23 (33.8%)	43 (63.2%)	2 (2.9%)	
	Good	**272**	**37 (13.6%)**	**222 (81.6%)**	**13 (4.8%)**	
Attitude	Poor	5	2 (40.0%)	3 (60.0%)	-	0.232
	Fair	**218**	**41 (18.8%)**	**164 (75.2%)**	**13 (6.0%)**	
	Good	120	20 (16.7%)	98 (81.7%)	2 (1.7%)	

* Significant: $p \leq 0.05$.

The majority of the households have a good level of knowledge as indicated in Table 3. Nevertheless, only 4.8% (n = 13) correspondingly have good practice. The rest practice poorly (n = 37, 13.6%) and fairly (n = 222, 81.6%). Similarly, out of the 218 households with a fair level of attitude, the majority (n = 164, 75.2%) are fair in their practice. The remainder are poor (n = 41, 18.8%) and good (n = 13, 6%).

Consistent with this study, Ahamad and Ariffin. [12], also found that students with high knowledge practiced moderately and students with moderate attitude still practiced moderately. The result of the simple linear regression in Table 9 shows a significant relationship between charcoal consumption knowledge and practices among households (β = 0.271, t = 5.184, $p < 0.05$). The regression equation indicates that for every unit increase in knowledge, practice is increased by 0.374 units. This confirms that knowledge was a significant predictor of practices among households. However, the respondents' attitude towards charcoal consumption could not be used to predict practices due to the lack of significant association between both variables. The overall result suggests that good knowledge and fair attitude towards charcoal consumption, though encouraging, may not be enough to elicit good charcoal consumption practice. To enhance sustainable charcoal consumption practice, both knowledge and attitude being the building blocks for practice should be increased where necessary.

Table 9. Simple linear regression predicting relationship between knowledge, attitude and practice.

	Unstandardised Coefficients		Standardised Coefficients	t	Sig
Model	**B**	**Std Error**	**Beta**		
(Constant)	0.742	0.156		4.748	0.000
Knowledge	0.374	0.072	0.271	5.184	0.000
Attitude	0.017	0.062	0.014	0.270	0.787

4. Conclusions

The current trend of consuming charcoal during cooking can have serious implications on people's health and in the fragile pastoral environment. This study investigated the knowledge, attitude and charcoal consumption practices among households in North-Eastern Somalia. Based on the survey, the following conclusions have been drawn.

- Households are knowledgeable about charcoal consumption despite the low level of education among the majority.
- The level of attitude towards charcoal consumption was found to be fair and could have been informed by their level of knowledge.
- Households with good knowledge and fair attitude are inclined to practice fairly.
- Knowledge was a significant predictor of practices but attitude towards charcoal consumption could not be used to predict practice due to the lack of association between both variables.
- Overall, the results suggest that good knowledge about charcoal consumption does not translate into good charcoal consumption practices.

To enhance sustainable charcoal consumption practice, both knowledge and attitude being the building blocks for practice should be increased where necessary. This can be achieved with appropriate intervention programs or policy such as education initiatives, research into the reasons for attitudes towards charcoal consumption, and awareness campaigns to promote safer and more sustainable charcoal consumption and woodland conservation.

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