Socio-Economic Factors Influencing the Choice of Cooking Energy Sources in Sokoto Metropolis

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Authors' contributions

This work was carried out in collaboration between the two authors. Author LNB designed the study, managed the literature searches, wrote the protocol, and wrote the first draft of the manuscript. Author SBS managed and performed the statistical analysis of the study. Both authors read and approved the final manuscript.

Original Research Article

ABSTRACT

The study was designed to assess different sources of energy and to establish relationship between socio-economic factors that influence the choice of energy types within Sokoto metropolis. The study area was divided into three locations based on the income level as low, medium and high income classes. Forty respondents were randomly selected from each location thereby having a total of 120 respondents for the study. Variables of interest included choice of energy, types of energy sources, factors that influence such use and preferences for the different types of energy. Semi structured questionnaire was used for data collection. Descriptive statistics (frequencies and percentages) and chi square test of association were used for data analysis. The findings showed that households use different energy sources daily and some factors were found to influence the choice of energy used in homes (electricity 0.5%, cooking gas 42.5%, fuelwood/charcoal 33.5%, and kerosene 19.2%). Such factors include area of residence (chi-square value 14.53 and p- value 0.024), educational level (chi-square value 49.246 and p-value 0.000) and income (chi-square value 14.950 and p-value 0.021). Based on the findings of this study, it was concluded that

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households in Sokoto state metropolis tend to climb the energy ladder from low energy types to modern energy types and it was recommended that households be sensitized on the negative effects of the traditional energy sources on the environment.

1. INTRODUCTION

Concerns for energy required for the running of homes, industries and the economy generally has been of global concern for some decades [1]. In terms of utilization, household energy accounts for about 40 % of the total energy consumption in developing countries [2]. Household energy is used for lightening, heating, cooking, Ironing, food and drinks preservation, powering electric devices, cooking and vacuum cleaning. Therefore, when energy occurs or price rise, many things may go wrong. This in part explains why members of the public shows serious concern when prices of energy rise. As with many goods and services, the demand for energy used depends on several factors. According to World Bank [2] 74% of household in Asia used solid fuels, mostly in the form of biomass. The situation is not much different in Nigeria where traditional sources accounts for over 70% Household energy supply [2]. While rural household rely more on biomass fuels than those in urban areas, a substantial number of urban poor household in Nigeria rely on fuelwood, charcoal, wood waste to meet their cooking needs.

Available estimates show that Nigeria consumes over 50 million metric tons of fuel wood annually, a rate, which exceeds the replenishment rate through afforestation [3]. Sourcing fuel wood for domestic and commercial uses are a major cause of desertification in the arid –zone states and erosion in the southern part of the country [4]. From available statistics, the nation's 15 million hectares of forest and woodland resources could be depleted within the next 50 years [5].

Generally, rural communities are mainly characterized by high population density, vicious circle of poverty and lack of infrastructure which includes lack of energy at household fuel [6]. This does not exclude the urban slums which share almost same characteristics with the rural communities which is different from the high income urban. The poor might not use the term "energy", but they can spend for more time and effort obtaining energy services just for basic human survival – cooking, cooling among other use [6].

The type of energy used in Sokoto state in recent times, especially in poor households, have not been helped by poverty and rising process of other more efficient energy types like electricity, kerosene and gas. For instance, in the year 2000, a litre of kerosene sold for ₦15 and 10 years later it sells for as high as ₦110. This represents a percentage increase of 86% and has put more pressure on households to devise coping strategies to cope with rising energy cost. Large amount of human energy are spent gathering fuelwood in many parts of the state, and the burden tends to fall more heavily on women and children. In many communities today, it is not uncommon to see women and children trek several kilometres in search of fuelwood in both rural and urban slums of Sokoto state [7]. One of the reasons that traditional energy sources is the preferred domestic fuel is that it does not require a complex and expensive infrastructure to be purchased and used as fuel.

It is against this background that this study investigated the household energy use patterns across inhabitants of Sokoto metropolis in Sokoto state putting into consideration the household energy uses attributable to different energy sources as well as some factors that influence the choice of energy consumption.

2. MATERIALS AND METHODS

2.1 Study Area

The study was conducted in Sokoto metropolis, Sokoto state which is located between coordinate 13°.05N 05° 15E/13.083°N 5.250° E. Sokoto state is located in the Sudan savannah zone in the extreme northern part of Nigeria; it has a land area of 2597 km^2 and a total population of 3.69 million people [8]. Humidity is low (45%) and solar radiation is high and it has a high temperature with minimum and maximum temperature of 13°C and 42°C and mean annual rainfall of 600-750mm annually [9]. The regions lifeline for growing crops is the floodplains of the Sokoto-Rima River system, which are covered with rich alluvial soil. For the rest, the general

dryness of the region allows for few crops, millet perhaps being the most abundant, complemented by maize, rice, other cereals and beans [10] in addition to tomatoes and few vegetables grown in the region. There are two (2) major seasons in Nigeria; wet and dry. In the study area, the dry season starts from October, and lasts up to April in some parts and may extend to May or June in other parts. The wet season on the other hand begins in most parts of the state in May and lasts up to September, or October.

2.2 Sampling Procedure and Data Collection

Stratified random Sampling technique was employed to choose the dwelling units within the metropolis where the questionnaire was administered. The metropolis was stratified into three strata based on three different income/ social levels as low, medium, and high (as described by the urban planning authorities in the state). Residents of each stratum were considered to be of the same economic and social status. Therefore, 40 respondents were selected from each stratum. The major instrument used for this research was a semi structured questionnaire which was carefully divided into three sections. The first section contained questions on the social and demographic background of respondents, while the second part deal with the types of energy sources attributable to different energy uses across the metropolis, the third part deals with the factors that influenced the choice of energy sources by household.

2.3 Data Analysis

The research involved quantitative method of analysis which includes descriptive statistics expressed in frequencies and percentages. Chi-square test of association/independence was used in order to establish relationship between socio-economic characteristics factors influencing the choice of energy as well as the future energy preference. Statistical Package for Social Sciences (SPSS) Version 20.0 was used for the analysis.

3. RESULTS

3.1 Socioeconomic Characteristics of the Respondents

Table 1 shows the socioeconomic characteristics of the respondents based on gender, marital status, age, household size, education attained, income level and energy cost.

Table 1. Socioeconomic characteristics of correspondents

Variable	Frequency	Percentage
Gender		
Male	35	29.20
Female	85	70.80
Marital status		
Married	96	80.00
Single	17	14.20
Widow	2	1.70
Divorce	5	4.20
Age		
20-30 years	23	19.20
31-50 years	71	59.20
Above 50 years	26	21.70
Household size		
1-5 persons	60	50.00
6-10 persons	50	41.70
11-15 persons	10	8.30
Education attained		
Tertiary	57	47.50
Secondary	15	12.50
Primary	2	1.70
Quranic	10	8.30
No education	36	30.0
Income level		
Low income	59	49.2
Medium income	55	45.8
High income	6	5.00
Energy cost		
₦ 1,000-5,000	69	57.50
₦ 6,000-10,000	43	35.80
Above ₦ 10,000	7	5.90

3.2 Energy Sources

Fig. 1 presents different energy sources identified in the study area. Cooking gas and fuelwood/charcoal constitutes greater percentage of the energy source with Electricity having the least percentage.

3.3 Reasons for Energy Source Selection by Respondents

Different reasons for energy choice were identified and a number of respondents were

more concerned with efficiency, cost and availability of the energy source while selecting energy source. Traditional factors influencing the choice of energy seems to be losing grounds within Sokoto metropolis as Fig. 2 indicates least percentage of the respondents attributing the choice of cooking energy to traditional beliefs.

3.4 Energy Preferences When Given Opportunity

Respondents were asked whether they can have another preference of energy source when given opportunity. The result (Fig. 3) shows that 32.5, 44.2, 11.7 and 11.7% of the respondents will alternatively prefer electricity, cooking gas, fuelwood/charcoal and kerosene, respectively.

3.5 Relationships between Socio-Economic Characteristics and Choice of Energy

Chi-square test of association/independence was fitted in order to test the relationship between socio-economic factors influencing the choice of energy and the result in Table 2 shows that occupation, gender, and age do not have significant influence on the choice of energy by different households while income, household size, area of residence and educational level attained has a great influence on the choice of energy use by households.
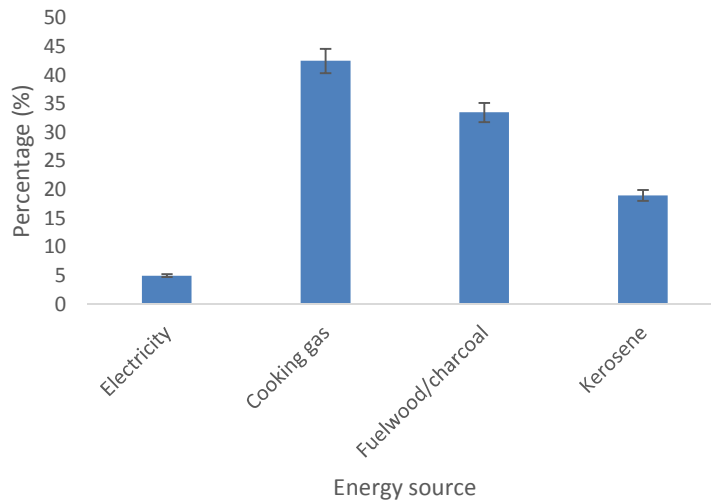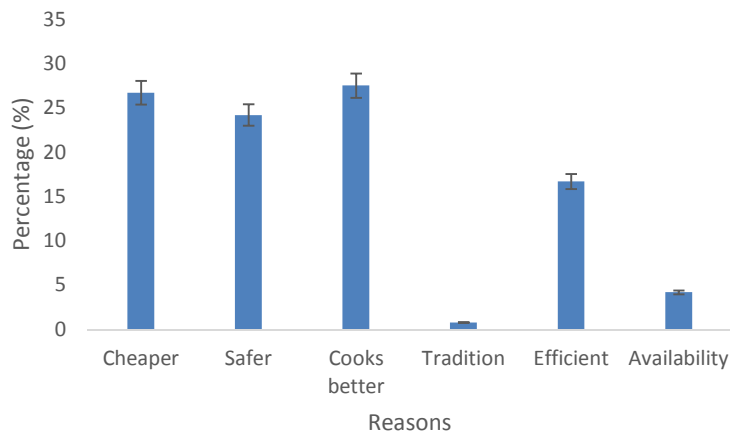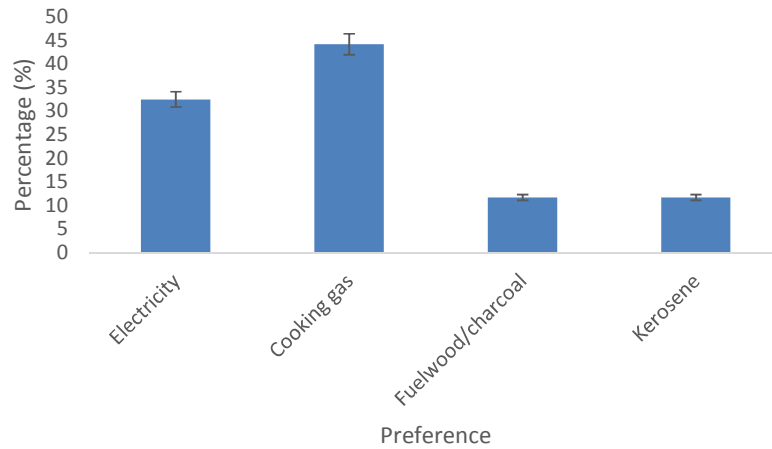

Fig. 1. Energy sources

Fig. 2. Reasons for energy source selection by respondents

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Fig. 3. Energy preferences when given opportunity

Table 2. Relationships between socio-economic characteristics and choice of energy

Variables	Chi-square	p-value
Income level vs energy source	14.950	0.021*
Area vs energy source	14.53	0.024*
Area vs cost of energy	41.042	0.000*
Marital status vs energy source	22.171	0.008*
Marital status vs energy preference	13.449	0.143
Education vs energy source	49.246	0.000*
Education vs preference	52.286	0.000*
Occupation vs energy source	26.015	0.165
Gender vs energy source	6.926	0.328
Age vs energy source	22.541	0.001*
Age vs preference	11.389	0.077
Household size vs energy source	39.579	0.000*

4. DISCUSSION

Female respondents are more encountered in the cause of this study and majority of them are married with an average family size of 5 persons per household. In most cases female folks are left with the responsibility of domestic activities (cooking inclusive), which makes them to have more idea about the more efficient sources of energy and in some cases can influence the decision to choose certain energy source over others. Educational attainment and income level are some of the socioeconomic factors that are very crucial to the choice of cooking energy source within the metropolis as seen in the findings of this study. Majority of the respondents that choose a better source of energy are within the age limits of 30-45 years, indicating that they are within active age who are more willing to listen and comprehend the ideas of using more efficient energy sources for domestic consumptions.

Cooking gas and fuelwood/charcoal are the most used probably because it is readily available for using, unlike kerosene which might be scarce sometimes and the dwindling electricity supply within the metropolis makes it impossible for the households to rely on electricity as the main source of cooking energy. This agrees with the findings of [2] and [11] that in Nigeria, fuelwood and charcoal constitute over 70% household energy supply.

Many respondents goes for electricity and cooking gas as the best source of energy when given preference probably because of its awareness that cooking gas is becoming cheaper and cooks food better compared to other sources and electricity might be cheaper and more efficient when it is readily available, fuelwood/charcoal as the least chosen because of awareness on how dangerous it is to the environment, kerosene also is not always available and when even available tends not to

be cheap. This finding agrees with the work of [12] and [13] that household relies on several energy types and sources.

Some socioeconomic factors were found to have significant relationship with the choice of energy. It was found out that income level has a great influence on the choice of energy use (i.e. the higher the income, the more people tend to use the best energy sources for cooking). The area in which they leave contributes greatly to the source of energy used by respondents. It could be that in such areas, only few sources of energy are available to the people for cooking. Education attained also contribute to the source of energy use by respondents, the more educated ones tend to go for the best cooking sources of energy than the least educated people. The number of persons per household contributes to the source of energy used by various households. If the number of the persons is small, the household use the best energy source but when the number of households is much, they tend to use the cheaper sources of energy.

Some socioeconomic characteristics has no influence on the choice of energy used by household such as occupation, gender and age. This means that regardless of these socioeconomic characteristics every individual wants to use the best energy source for cooking. This study agrees with some the empirical study of the work of [14], [15] and [13] and the concept of energy ladder model as used by different researchers on household energy [16,17]. They found out that income, intra-household income distribution, socioeconomic distribution and household characteristics influences energy consumption levels. When income increases household not only consume more of the same energy source but they climb the ladder to the modern energy sources with higher qualities i.e. as a household gains socioeconomic status, its ascends the ladder to cleaner and more efficient forms of energy.

5. CONCLUSION

The study discovers that households within the metropolis responded differently on their energy use pattern. Their choice of energy can be related to level of education, age, occupation, location, type of food prepared, marital status, income, household size and energy price. The use of electricity is mostly associated with its availability; gas is associated with levels of education, price and income. Kerosene is associated with its availability and high price; fuelwood/charcoal is associated with cheapness and availability. Based on these findings, the study concludes that households in Sokoto metropolis with average and above average incomes tend to climb the ladder from low grade energy types to modern energy when income increases and such energy is made available. While those below average income still resort to low grade traditional energy for cooking.

More efficient energy types should be made available, accessible and affordable to households in Sokoto state. This is because those with income above average, average and below average showed interest in the use. There is also need for sensitization in all the areas. The low income earners as well as high income earners that still use the traditional source of energy for cooking need to be informed about the negative impact of the traditional energy types they use on the environment. Poverty is also an issue that needs to be addressed as people with low income tend to use more of traditional energy as against high income earners.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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